THE MODERN FAMILY DOCTOR

A GUIDE
TO
PERFECT HEALTH

UNIFORM WITH THIS VOLUME

JACK'S REFERENCE BOOK

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HISTORY OF THE BRITISH NATION

THE MODERN FAMILY DOCTOR

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A GUIDE TO PERFECT HEALTH

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INTRODUCTION

The science of medicine would be limited by most people to that branch of knowledge which is concerned with the healing of injuries and the cure of diseases; the common aim and conscious intention of all who study medicine, the sole duty of the medical practitioner, being confined, in popular estimate, to the fulfilment of these tasks. But there is another idea of medicine, more real, more effective, less often insisted upon—an idea of medicine as the art not only of curing disease, but of eradicating it; as a practice aiming not only at the recovery of health when lost, but at the discovery of the laws, and the regulating of the conditions, by which actually existing health may be preserved.

This idea of medicine as a practice based not only upon disease but upon physiology is a very modern one. It is the finest flower, the latest product of the science and art of medicine whose roots, in the service of healing, may be traced to the virgin soil of all civilised communities. The most universal symptom of disease, the first indication of something wrong with the living organism, is pain. And effort to mitigate pain or, at any rate, purposeful reaction to its stimulus, is perhaps the most crucial test whereby animate are differentiated from inanimate objects. To seek and to apply remedies for physical discomfort and pain is the most primitive of the primeval instincts. Unnatural pressure upon the body, artificial restraint upon free movement of limbs, every kind of injury, are associated with pain or other disagreeable accompaniments, which lead, in animals as well as in man, to an instinctive response towards removing these evils. And such instinctive reaction—the child stretching its cramped limbs or scratching its irritated body, the injured dog licking its wound—are the origins from which definite curative systems have arisen during the evolution of every civilised community: crude systems of remedies which, according to Celsus, the lowest tribes of man possess for healing their wounds and curing their ailments.

Originating thus from instinct, and fostered by human sympathy with suffering, the practice of healing has tended in all primitive communities to grow into a useful and effective art of medicine. This art, however, with the further evolution of civilisation, has tended to degenerate. In the darker ages of all civilisations we find medicine no longer an effective, practical, although restricted, art, based upon observational knowledge; we see rather, masquerading under the name of medical art, pretentious systems of healing carried to an absurd and extravagant extent; elaborate systems of theoretical knowledge, which, ever developing in complexity without gaining in meaning, have tended to become less and less effective in practice, from century to century. Thus, for long periods, in all European countries, the study of medicine was dominated by the scholastic subtleties of visionary philosophers, and was inspired by that whole range of ineradicable faiths in unproven powers which, springing lustily from the roots of superstition, have contaminated the ancestry of all the sciences.

The causes of disease, from the point of view of experimentation and examination of facts, were entirely neglected. The substance of medical practice consisted in prescribing for imaginary ailments from mystical compilations called the "poly-pharmacies"—prevailing beliefs as to the nature and causation of disease being arrived at, not by methods of disinterested investigation, but from current tradition and superstition. Of these superstitions, the belief that health and disease were controlled by dæmons, and other supernatural dispensers of good and evil, was the chief; another superstitious belief was that diseases were devils, in temporary possession of the human body, which would only be cured of its infirmity when the intruders were evicted by the application of appropriate incantations, purgatives, blisters, and emetics; and most of the substances upon which the nourishment of the body depends have in turn been regarded as the source of its infirmities.

Yet, from this medley of incompatible notions, from this organised confusion of wild hypothesis and capricious conjecture, a unified and legitimate science of medicine eventually merged. In Europe, with the renaissance of the scientific method at the close of the Middle Ages, just as a standardised science of chemistry evolved from alchemic superstition, just as a science of astronomy reduced to order the chaos of astrology, so did medicine pass from the sway of tradition and superstition and become a rationalised branch of knowledge. But the effective and wholly admirable science and art of medicine, as understood to-day, dates back no further than the eighteenth century, when the new idea of "preventive medicine" first dawned—the idea of medicine as a science of health, as well as of disease, as a practice aiming at the prevention, as well as at the cure, of those diseases which affect the lives of men.

It is difficult for those leading the State-regulated, hygienic life of to-day to realise the conditions in which men lived before the conception of this new idea of medicine as a science of health, or for them to understand the extent and import of the hygienic changes which have occurred since that epoch. In England, one prominent landmark points the new development—the Great Fire of London in 1666. This catastrophic event, terribly calamitous as it must have appeared to be at the time, was perhaps one of the greatest blessings in disguise which could have happened at that period of English history. For centuries the sanitary condition of London had been becoming more and more deplorable. Its mean and narrow streets were the harbours of all kinds of filth and garbage; its unventilated and verminous dwellings were overcrowded with occupants; personal cleanliness was totally disregarded, and systems of drainage and sewage were practically non-existent. From the modern hygienic point of view, the position of the mediæval Londoner was inexpressibly forlorn. The dangers of dirt he could not calculate; with the evils of defective sanitation he had no power of reckoning; health was threatened on all sides: but for him the menace had no meaning. Polluted water, stagnant air, dirt sanctified, sanitation non-existent—entangled by these four conditions pre-eminently inimical to health, it is not surprising that, compared with our own crusades, man's strife against disease, through the medium of the "poly-pharmacies," should have been singularly ineffective.

The mortality from the long series of plagues, pestilences, and famines, from which England was hardly ever free, was frightful. Victims were purged and bled: yet in 1665, 100,000 died of the Plague in London alone. Then came the purification by fire. That is why the catastrophe of 1666 is regarded as so important a landmark in the history of hygiene. With the destruction of Old London, 300 acres of breeding-ground were purified from the germs of plague and of other diseases which never again appeared in these islands. And thus was the way prepared for the construction of a more hygienic city by those pioneers of the health idea whose advent already loomed on the social horizon.

Social reform is controlled and inspired by the energy and devotion of a few pioneers, whose mission it is to formulate ideas for the happiness of man, and whose fate it is, when their ideas have passed into the common stock, to be speedily forgotten. Chief and first of the pioneers of the health idea is the name of John Howard. It is due to the humanitarian efforts and propagandist zeal of this great eighteenth-century reformer that legislation was first directed towards the maintenance of public health, a legislation which, based upon scientific knowledge of the causes of disease, regulates to-day an enlightened policy of health administration, and is one of the assured legacies of the twentieth century. John Howard devoted his life and wealth to alleviating the sufferings occasioned by the abuses and the insanitary conditions of prisons, hospitals, schools, and benevolent institutions.

In 1777 he published a book entitled *The State of Prisons in England and Wales*, which subsequently led to an Act of Parliament for enforcing the cleansing, and standardising the sanitation, of prisons. As an outcome of his researches, it came to be recognised, for the first time, that plagues and fevers were due to, and propagated by, dirt and insanitary conditions; and the reconstruction of the old dilapidated and verminous prisons and hospitals, &c., which followed upon his inquiries, stamped out the dreaded gaol fever and its allies from our public institutions as effectively as the Great Fire had exterminated the plague in London. Modern sanitation, not only in public institutions, but in the houses of the people, may in justice be traced to the early efforts at reform of John Howard.

The aim of these hygienic reforms was to prevent disease which, as Howard had realised, was due to defective sanitation, and was one of the evil results which inevitably follow from neglect of cleanliness and from the overcrowding of human dwelling-places. The first notion, however, of a veritable "preventive medicine" is indelibly associated with William Jenner, whose name has been immortalised in the annals of sanitation by his discovery of the effects of vaccination. This discovery, the outcome of a prolonged series of observations and experiments, has to-day almost rendered extinct that last of the serious epidemic plagues which in the past have decimated England—the still dreaded plague of smallpox. In 1867, the vaccination of infants was made compulsory by law; with the result that, apart from occasional sporadic cases, the disease of smallpox is now only rarely encountered. Vaccine is a genuine medicinal antidote for, as well as a protective against, the occurrence of smallpox: and thus, in the strictest sense of the phrase, William Jenner is rightly regarded as the father of preventive medicine.

Finally, the names of Davaine, Laveran, Pasteur, Löffler, and Koch must be placed high on the list of those pioneers whose scientific insight and efforts have promoted the health, and consequently the happiness, of the world. Bacteriologists all of them, microscopic research led Davaine in 1850 to his discovery of the *Bacillus anthracis*, the microscopic organism which generates anthrax disease, the first true germ or cause of disease to be identified; led Laveran, some forty years later, to his isolation of the malaria parasite; led Pasteur and Löffler to their discoveries of antitoxins by the administration of which the poisons of hydrophobia and diphtheria are neutralised, and these diseases are cured; and, last but not least, led Koch in 1882 to his discovery of the *Bacillus tuberculosis*, in whose identity the cause of consumption was at last driven to earth.

By the investigations of these men, the "germ theory," under whose guidance the modern crusade against disease has been directed, received final and experimental verification. The ancients imagined disease to be due to dæmons in possession of the living body; modern experimentalists have materialised these spectres into small living particles or germs which, under the microscope, can be seen engaged upon their work of destruction.

Along these three tracks, *i.e.* in the direction of sanitation, of preventive medicine, and of bacteriology, and under the influence of education and of parliamentary enactments which have followed closely in the wake of scientific discoveries, the health idea, during the last few decades, has unfolded with unparalleled activity.

We see, then, that the culture of health, although it may be the less familiar, is the first and principal of the two departments of medical science. Its aim is to regulate the conduct of life for the conservation of actually existing health; the purpose of the second department, which is called therapeutics, being the re-establishment of health when lost. Of these two departments, the first is undoubtedly the most serviceable to the welfare of mankind. It is more important for every man to know how to preserve health, than how to cure diseases, the acute phases of which are cured more by nature than by art, and none of which can be safely combated without expert advice and assistance.

In an address on preventive medicine, Sir James Barr stated that "the public must be taught that the health of the nation is its most valuable asset, and that the maintenance of health is of much more importance than the treatment of disease. If the public were only alive to their own interests they would pay medical men liberally for directing them in the paths of truth and in the ways of health rather than for treating their diseases." Yet it is an extraordinary thing that while books of popular instruction in that branch of medicine which aims at the cure of disease are so many, the supply dealing with medicine in its relation to the preservation of health is so woefully inadequate.

The purpose of the present work is to remedy this deficiency, the objects aimed at being threefold. In the first place, the purpose of the book is to fulfil the substance of Sir James Barr's injunction, by providing a widespread knowledge of how health may be preserved by obeying the laws and conditions upon which a healthy life depends—the possibility of this obedience following upon an appreciation of the causes and conditions which induce departure from health. Its second purpose is to teach how the many diseases which are a constant menace to health may be avoided by realising the nature of all such diseases, by knowing what particular ones are attendant upon particular circumstances and conditions of life, and by understanding what preventive measures should in every case be taken. Every man should be his own doctor, it has been said. Yet, when stricken with typhoid fever or appendicitis, how can any man attempt to be his own physician? By no amount of ingenuity can a medical text-book be made to play the leading part in a surgical operation, or take the place of the presiding physician when disease is established.

The duty of every man is to preserve his health, not to attempt to combat diseases. The layman cannot substitute, but he may anticipate, the work of the doctor, by healthy living, and by taking precautionary measures against disease which are at every man's command. It is the third purpose of this book to provide, as far as possible, within a reasonable compass, all information the layman need possess on the subject of doctoring, and full instructions as to when he should, and when he need not, look for expert assistance. In five directions in particular the layman needs instruction. (1) He should have a knowledge of the incipient signs of diseases, so that they may be taken in hand promptly, that the best may be done immediately to arrest their progress, to mitigate their severity, and to preserve the victims from serious after-effects. (2) He should be familiar with the salient signs and symptoms of poisoning, and with the expedients to take in cases of poisoning. (3) He should know how to give first aid to the wounded and how to treat, on the spot, all cases of accident. (4) He should be able to differentiate real from imaginary diseases, and be familiar with the treatment of all trifling ailments; and (5) he should know how to behave in cases of serious disease until a medical practitioner can be obtained.

The constructive idea, then, at the root of the book is a practical and educative one, and this explains the policy and the scheme upon which it has been developed. This policy concerns itself mainly, as already described, with the personal maintenance of health in the individual, and within the sphere of the home. But in a subsidiary way it extends beyond the range of individual endeavour, and deals with the wider factors of national health: the State control of health in the collective life of the people; the universal control by legislation and individual effort of the legacy of national health to be bequeathed by the present to future generations, a legacy by which a race may develop of people sturdy, independent, healthy, and contented, who may "multiply exceedingly, and whose days may be long in the land."

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THE MODERN FAMILY DOCTOR

DEFINITION AND SIGNS OF HEALTH

The well-known saying that "no man is a good physician who has never been sick" contains at least two elements of truth. In the first place, not until he would cure himself does the physician realise his own impotence to effect a cure without the aid of his invincible ally, the healing power of nature; and, secondly, only through personal experience of health lost does the physician learn what all the schools may have failed to teach him—the true nature of the blessing he seeks to regain. No man can make a good physician until he has realised this fundamental maxim of modern medicine—that man can only lose his health; nature alone can restore it. And nowhere is the full import of this maxim so readily appreciated as upon a bed of sickness.

If it were a desire to be his own physician which prompted the reader to turn to this book of health, this opening note might not sound inspiriting. Yet the purport of this reference at the outset of our thesis is merely to emphasize one point: that health, or the state of feeling well, is very closely akin to what the French call well-being—the feeling of fundamental happiness.

A colloquial description of health as felt by everyone is that it is the bodily state inseparably connected with the most perfect enjoyment of life: that is to say, the physical condition of the ideally healthy person is such that he not only enjoys life, but possesses the most perfect experience of being alive of which he is capable. To define, however, the bodily state of health more precisely, and more satisfactorily to science, we must be explicit: and we will accordingly quote the authority which says that "the state of health is one in which all the functions and organs of the body and mind work together harmoniously and without sensible disturbance." The patient consults a physician when he is not feeling in health: the physician describes to his patient the physical source of his feeling, and prescribes for any departures from health according to the derangement or inharmonious action he may discover in the organs or functions of his patient's body.

It will be apparent that the definition we have quoted is an ideal conception only of health. It is the state of no particular person that ever lived, but of the ideally healthy person in the abstract. Amongst living creatures there are no such things as perfection of bodily and mental structures, and perfect harmony in the working of mind and body: the possibility of such perfection would imply a physical stability and a finality of mental development inconceivable in the human organism, whose functions are constantly disturbed by external conditions, and vary widely in male and female, and to some extent in all individuals, and change progressively with increasing years. Thus the loss of a limb, or indeed of certain of the visceral structures of the body, does not necessarily imply any corresponding loss of health; an athlete may be in excellent health, yet, at the completion of some strenuous exercise, his functions and organs would not be working together without sensible disturbance; and similarly, a man who, according to the relative perfection and harmonious action of his body and mind, might be judged as robustly healthy at eighty, would not be so regarded were he twenty years younger. It follows, then, that health is not one definite thing, capable of exact definition, but exists in all gradations, from an imaginary perfection of the organs and of their working at one extreme to the complete cessation of their ministrations or death at the other; and its excellence in any particular individual can be estimated only by reference to the possibilities of his constitution and to the particular circumstance of his life.

Looking upon the human machine, at any stage, as the embodiment of the perfection of life, then health is the most perfect state of this most perfect of living things, and can be defined as the harmonious disposition and working of all parts of the living human body, relatively to the age, sex, and temperament of the individual who is living in health, to his history of disease in the past, to his liability of becoming diseased in the future, and to his adaptability to the stresses of the environment in which he is placed. To appreciate the full import of this definition, the terms temperament, liability to disease, and adaptability to environment, require a little explanation.

Temperament is a general term which signifies the mental and physical peculiarities by which people are distinguished. Thus, certain individuals show, on the one hand, a marked aversion for, or are disagreeably affected by, and on the other hand display a predilection towards, or are stimulated by, certain things which upon other people have no influence whatsoever. We cannot explain these and similar constitutional differences between people; we acknowledge them as fundamental facts of life by saying that people differ in temperament: consequently, questions connected with an individual's health can only be satisfactorily discussed by reference in every case to his peculiarity of temperament. It must not be imagined, however, that antipathies, or idiosyncrasies of temperament, constitute well-defined categories within which individuals may be rigidly classified. On the contrary, degrees of physical and mental peculiarities so gradually merge into one another that classification of human beings by their possession or non-possession of particular temperaments is no more satisfactory than their rigid grouping by the presence or absence of any other natural attribute or condition. In fact, the distribution of temperamental idiosyncrasies in any population obeys the same law which governs the distribution of all human qualities—the law of natural variability.

The existence of variability, of the fact that no two people are alike, is, of course, patent to everybody. But a truth less universally recognised is that this variability of human attributes is not qualitative in character, but always consists ultimately in differences of degree only. We distinguish between tall and short people, between people who are thin and those who are corpulent, between young and old, wise and foolish, good and bad, and so on, with all physical and mental attributes and conditions. The qualitative differences, however, suggested by these verbal distinctions, have no existence in reality. There is no line of frontier, for instance, between good temper and bad temper, between diminutive and tall stature, between wisdom and folly, &c. &c., : these are mere verbal descriptions of extreme degrees of attributes which in some degree are present in all men; and which differ in degree only, never in quality, as possessed by different members of the human race.

And as with these common distinctions, so with the less familiar peculiarities of temperament by which men are colloquially distinguished. Men display an endless variety of antipathies, and idiosyncrasies of temperament. Some men are phlegmatic; others are sanguine; others are choleric. Some desire sweet things, others sour; some show aversion to animal, others to vegetable food; and some again crave always for a mixed diet. Some men are purged by astringent medicines, others remain unaffected by the strongest purgatives; in many children so small a dose as a fraction of a grain of opium would be a lethal measure: yet De Quincey confesses to have taken half a pint of laudanum without being vitally affected. Again, some men have a horror of open spaces, others dread a place that is confined; some faint at the sight of blood; some are convulsed by particular smells; whereas others, unaffected by sights or smells, at the sound of scratched silk, or of the grinding of knives, or of a moist finger drawn across glass, will shiver or recoil.

But the more we analyse these differences, or attempt to classify men according to the peculiarities they display, the more do we find in all these respects that men do not differ *qualitatively* from each other, as the verbal distinctions describing them imply: we find rather that all these apparent differences of quality consist ultimately in differences of *degree only*. We find, for instance, that there is no line of demarcation between a sanguine and phlegmatic temperament; we realise rather that there is every degree of temperament between an extreme lethargy in pronounced lymphatics to an extreme vivacity in the markedly optimistic. And, in the same way, we find that there is no dividing line between the vegetarian and his opposite; between those who have an idiosyncrasy and those who have antipathy for particular kinds of food; between those who are convulsed by, or who faint at, shiver at, or are indifferent to, certain sights, tastes, smells, and sounds: these extreme peculiarities will be found rather merging into their opposites by insensible gradations.

"One man's food is another man's poison" is a safer formula in the practice of medicine than the more questionable adage which asserts that "sauce for the goose is sauce for the gander." For, if tested on a large series of people or upon the same person in different conditions, any one potent drug will not only never be found to react in precisely the same way in two cases, but will invariably be found to agree or disagree with the human economy on a graduated scale marked signs of well-being at one extreme which merge into profound symptoms of poisoning at the other being the manifest result of the experiment.

It follows, then, that good and bad health are not specific conditions or states of mind and body, separated from each other by a definite partition. There is no one human state with invariable outward and physical signs of one inward condition of feeling, there is no unchangeable perfection of organs and harmony of their working which underlies any and every form of health, and is its only explanation and its sole promoter. There is, in short, no absolute difference in nature, as opposed to degree, between those beings who are, and those who are not, healthy. The notion of health should not be that of a unique state common to all people living in health; it should consist rather in that of a complex group of states which, varying in individuals, and between different individuals, merge from ideal perfection at one extreme, through every degree of increasing disposition, to chronic bad health at the other—all these states, nevertheless, being separated by a well-defined line of demarcation from that other complex group of conditions opposed to health, and which is called the state of disease.

What, then, for a condition so widely variable, is the standard by reference to which our judgments of health are to be estimated? According to the end we have in view, one of two standards may be employed. Firstly, a person's position on a general scale of health may be gauged by comparing his actual state with that ideal conception of health to which some people approximate, but which none attain—the condition, already described, in which all the organs and functions of the body work together harmoniously and without sensible disturbance. The employment of this standard would be comparable to estimating a man's competence at golf by comparing his play with that of the imaginary "bogey," whose performance is that of no particular golfer but of an ideally perfect player in the abstract. By constant effort, attention, and striving after the ideal, the form of play ascribed to "bogey," the perfection of health described by our definition, may be attained with *more or less* success by different men: a few will approximate to, most, despite of every effort, will inevitably fall far short of the ideal, be it that of golf or health.

When judging the health of a community, the general standard of health we have described would be the most useful one to employ; but if the health of any particular individual is the object of judgment, another kind of criterion, one relative to the individual under examination, and based upon his own temperament and capacity, will be found to be the most appropriate and practical standard. Good health in the case of one individual might, in another, be accounted far from good; the healthy person is one who is free from disease, and is in possession of the most perfect enjoyment of health of which he, as an individual, is capable. Admittedly, even when judged by their own native capacity for enjoying life, individuals will vary rhythmically in health from time to time: just as a golfer on one day will be playing on the top of his form and on another will be less perfect in his play.

These variations are inevitable, and are beyond human control. "Man cannot transcend the tyranny of his organisation"; and no one can escape the ups and downs of life, or by taking thought "add one cubit unto his (natural) stature." But to whatever extent individuals may fail to attain in their own being the finest conception of well-being, upon one truth all may rest assured: that the closest approximation to the ideal within the powers of any individual will only be reached by constant effort, clean living, and absolute obedience to the hygienic code whose canons it is the purpose of this book to reveal.

In reference to this code, it is appropriate to state here a natural consequence of the law of variation, namely that, just as there is no ideal state of health within the reach of everyone, so is there no rigid set of rules by which everyone's health may be regulated. Just as the bodily organs and functions differ sensibly as we pass from one man to another—although both may be regarded in equally good health—so the same food and drink, exercise and rest, work and play, will not necessarily lead to the maintenance of the same degree of relative health when prescribed for different persons. This man lives on a vegetable diet, leads a sedentary life, sleeps for twelve out of every twenty-four hours, and by these means keeps himself in health; another takes a mixed diet, enjoys an exciting life with only a minimum of sleep, and also remains in good health: give meat to the former and he immediately becomes ill; whereas the latter, accustomed to little sleep, if compelled to rest during the round of the clock, would promptly lose in health.

There is no standard of health common to all people, and no regimen of diet or of life which will necessarily conduce before all others to perfect health: the conduct of life must be considered always in relation to the age, sex, and temperament of the individual, to his predisposition to disease, and to the circumstances in which he is placed.

Closely related to his temperament, another highly variable condition by which a man's health must be judged is the bodily diathesis, idiosyncrasy, or predisposition to disease. The best example of this kind of human attribute is to be found in the tubercular diathesis or predisposition to the many forms of consumption. Since Koch's discoveries in 1882, consumption has been universally recognised as an infective constitutional disease. It is an infection, because it depends upon an invasion of the body by the tubercle bacillus; the liability to invasion, depending upon a certain inherited degree of vulnerability of bodily tissue, defines the constitutional character of the disease. This vulnerability of tissue, predisposing to consumption, is something different and distinct from the disease itself, which is only produced by the invasion of the body by Koch's bacillus.

Yet here again, as with all human attributes, the quality of vulnerability referred to is not a definite entity: those possessing the quality not being inevitably infected with, and those without it not being as assuredly immune from, the disease. Liability and immunity to consumption do not refer to an absolute vulnerability of one person's organs, and an absolute invulnerability of another's, to attacks from the bacillus; these are rather relative bodily conditions, and depend upon the extent to which the tissues are *more or less* resistant to the invasion of the special organism, to which the tissues possess a *small or large* susceptibility to the tubercle bacillus.

But the tubercle predisposition is one only of a long list of morbid predispositions in man, and consequently, in our estimations of health, and in our efforts to cultivate it, these predispositions must be reckoned with. From the integrity and harmonious disposition and working of his organs this man may be pronounced in robust health to-day, but if he possess a high degree of the tubercular predisposition this appearance is illusory; in these circumstances, despite the apparent integrity of his constitution, he would not be reckoned as a first-class life for insurance: well, to-day, he may to-morrow pass into the ranks of the diseased. On the other hand, another individual, although liable to all kinds of trivial complaints, and seemingly delicate, may be so resistant to serious maladies that he may live, despite his apparent delicacy, to extreme old age. It will be realised how necessary for the preservation of health are considerations of the predisposition or constitution of the body which, despite the integrity of his organs and functions, render it vulnerable to disease.

The point to be borne in mind is that health consists not only in the soundness of organs, but upon the quality of their integrity; not only upon an absence of derangement in their functions but also in the manner in which the functions are carried on. A proper appreciation of a person's constitutional proclivities or predispositions not only enables him to regulate his life and habits to the preservation of the best possible existing health, but serves as a beacon guiding him as to which diseases he should be most careful to avoid. In the modern crusade against consumption, for instance, it is believed that a tissue, vulnerable by inheritance, may be made resistant by appropriate treatment and conduct of life; it is believed that, in hygienic conditions, Koch's bacillus can be warred against and killed, or that, at any rate, it may be avoided. On the other hand, it is also believed that a tissue, naturally resistant, may become vulnerable in a debilitating environment, or by repeated association with the bacillus.

The adaptability of the organism to environment, or its capacity for adjusting functions to varying conditions of life, is a final factor of great importance in relation to the cultivation and preservation of health. Every change of environment effects some modification of the animal functions, and may act on the whole organisation equally, or may be restricted to particular parts. Thus, every change of temperature provokes a complicated adjustment of the whole of the bodily mechanism; exposure to the rarefied air on the top of a mountain, or to the compressed air in a caisson chamber, produces marked derangement of circulatory and breathing functions; similarly, air contaminated by the respiration of men and animals, by combustion of lights, by smoke and deleterious dust, has profound effects upon all the bodily functions; whereas bad habits of life, continued use or disuse of particular parts of the body, and prolonged exposure to extreme conditions of temperature and climate, such as those pertaining in the tropics, for instance, are not only potent in producing transitory effects, but by inducing definite and permanent alterations in the bodily economy.

We need not further particularise the vast extent of bodily reactions to changes of environment; these will be fully dealt with in other parts of the book; but if it be borne in mind that, in powers of adaptation, individuals vary as widely as they do in temperament and in predisposition to disease, the importance of giving due weight to environmental conditions when estimating, or prescribing for health, will be duly appreciated.

To resume: we have seen that health, essentially a state of feeling associated with being alive, is indefinable, and can only be described in terms of the physical basis of life and in relation to particular individuals, living in health. We have seen that, thus regarded, health consists not in any culminating point of perfection attainable by all in the exercise of bodily functions: but rather that its interpretation admits of a good deal of latitude, including within its scope a wide range and combination of highly variable functions, and a variety of ways of living in good health. In short, the chief point to be gathered from the preceding remarks is that there is no one definable state of health common to all people; that everyone, rather, has his own way of being in health: the realisation of this condition in every case depending upon the disposition of the subject and the form of his temperament, his predisposition to disease, and his native adaptability, which enables him to resist fatigue, temperature, climate, hunger and thirst, and other environmental conditions inimical to life.

We have emphasized this broad view essential for a rational conception of health because of the danger which lurks in a narrower aspect—a danger which, fostered by text-books and against which, in their perusal of the present work, we would specially guard our readers—consists of the instinctive tendency of regarding practical medicine as an art that can be perfunctorily administered, and conducted by rule of thumb: whereas the one essential for the successful cultivation of health is the adaptation of treatment to each individual subject, and, in the case of disease, to the personal quality and particular stage of the patient's malady. The good and effective physician treats his *patient*, and not the *ailment* from which he suffers. Yet, in regard to the personal peculiarities of health and disease, there is truth in the saying that "every man at forty is a fool or a physician"; for age certainly brings to every man a knowledge of his own constitutional weaknesses, and an acquaintance with the maladies and precautions best suited to his temperamental idiosyncrasies.

Nevertheless, the wide variability and inevitable personal elements we have described in the nature and conditions of health do not preclude the existence of certain general signs and symptoms by whose existence good health in the main can be identified. Health, as we have said, demands the harmonious action of all mental and bodily functions; but, necessarily, the action of those organs upon which life depends will be subject to less individual variability, and must before all others be preserved, if health is to be maintained. Consequently, the most valuable and reliable general signs of health will be revealed by an examination of these relatively vital organs and functions. The regular heart-beat, the quiet rhythmic expansion and elastic recoil of the lungs, the normal constitution of excreta and constant range of bodily temperature; the regularity and ease of the digestive functions; the free movement of the limbs, the effective exercise of the mind, refreshing night's sleep succeeding the good day's work—all these and similar signs, which will be described in detail under the sections of anatomy and physiology, must be present if the subject under examination is to be pronounced in health.

On the other hand, no one can be regarded as healthy who is not exercising all his functions in a way characteristic of himself and satisfactorily in relation to his age and circumstances. Again, the regularity, facility, and promptitude with which the functions of the mind and body are exercised; the rhythmic changes of functions, such as sleeping and waking, with changes of time and season; the satisfaction, tranquillity, and well-being resulting merely from being alive—these are general symptoms, which, although varying in degree in different individuals, must be prominently present if a bill of good health is to be delivered. Generally, also, a thin habit of body, clear complexion, and tonicity of the muscular system are more suggestive of established health than are obesity, a sallow skin, and flabby muscles, which betoken a liability to indisposition and ailments.

It is also a good sign when the appetites, the digestive and excretory functions, the capacity for activity and sleep, and all the needs of life recur every day and punctually at the same time; when an amount of exercise demanded by the economy can be taken without fatigue or disturbance of other functions; and when the mental stresses of daily life can be met tranquilly and effectively. Finally, the one symptom before all others indicative of a sound mind in a sound body is freedom from pain and bodily discomfort and a complete absence of palpitation, the feeling of pulsation, oppression, and of other similar conditions in any part of the body, or accompanying its functions, of whose existence the healthy person is entirely unconscious.

THE HUMAN BODY

THE CELL AND THE EMBRYO

The human body, like that of all animals and plants, is built up of a vast mass of minute units of living matter called cells, which small as they are—they may be no more than $\frac{1}{5000}$th of an inch in diameter—are yet somewhat complex in structure. The substance of the cell body (*protoplasm*) contains the chemical elements present in organic compounds, and the machinery for reproduction by division. There are few cells, such as the amœba or the white blood corpuscles which have an independent existence, and even in them there is a tendency for certain parts to be reserved for different functions. Most cells are elements in the composition of higher living organisms, and have lost the original ability of the cell to perform all the functions of life. The predominating function of the cell or set of cells depends upon its position in the organism and upon other conditions. The function may be contractility, secretion, &c., and it is by the aggregation of cells with a similar function that tissues and organs arise.

Every cell originates from a previously existing cell by a process of cell-division, certain parts of the cell dividing into two and then moving to opposite sides of the cell nucleus. Further division takes place, the cell becomes constricted across the middle, and at length complete division takes place, the two daughter cells resembling in all respects the parent cell.

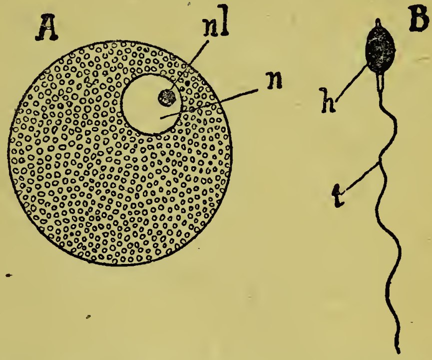
For the function of reproduction of the individual certain special cells are set aside in the body, the *ova* in the female and the *spermatozoa* in the male.

An *ovum* is a comparatively large spherical cell, about $\frac{1}{120}$th of an inch in diameter, and resembles the typical cell described above. It has, however, two containing membranes, the outer of which is thick, and pierced by minute canals. The cell substance of the ovum, the *yolk*, contains a great number of nutritive granules. Before it is mature an ovum has twice gone through a process of cell-division and has lost a number of parts of its nucleus.

A *spermatozoon* is only a little more than a third of the size of an ovum in length, and is composed of a barbed, flat, oval head, a rounded body somewhat longer than the head, and a tapering tail six or eight times as long as the head, the power of movement of the cell being due to the lashing of the tail.

In the process of fertilisation which must take place for the reproduction of a new individual, the spermatozoon meets the ovum, passes through one of the minute canals of the outer membrane and penetrates the substance of the ovum with its head. The tail of the spermatozoon then disappears, the head and body turn into a nucleus which blends with the nucleus of the ovum, supplying the parts which had been lost in cell-division.

After a short resting period the ovum commences to reproduce generations of cells in the outer membrane, which mass together, flatten out and begin



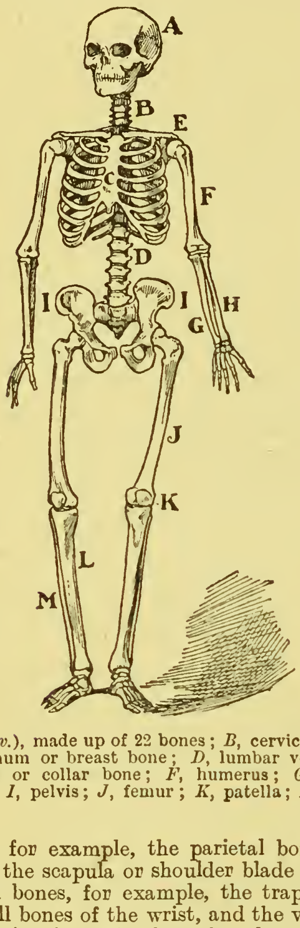
Reproductive Cells.—*A*, ovum; *B*, spermatozoon; *h*, head of spermatozoon; *n*, nucleus of ovum; *nl*, nucleolus of ovum; *t*, tail of spermatozoon.

to arrange themselves into three layers which severally develop into the different tissues and organs of the human body. One tiny fold forms into a groove which folds over and meets to form the rudimentary brain and nervous system. The vertebral column and the membranes of the brain and spinal cord begin to develop, and one of the layers divides into rods traversed by clefts from which the striped muscles of the body grow. At a certain point this same layer of cells develops into the connection of the embryo with the wall of the ovum, and grows into the structures by means of which the child before birth receives nourishment from its mother. This same layer develops into the skeleton, the blood and blood-vessels, the urinary and reproductive systems, the fatty tissue, and marrow of bones, and the teeth, all but the enamel. The teeth enamel, skin, hair, nails, nervous system, membranes of the mouth and nose, and the lens of the eye come from another layer. And the third produces the lining of the alimentary canal of the larynx and lungs, and the secreting cells of the liver, pancreas, thyroid, and thymus.

THE SKELETON

The human skeleton, the bony framework which supports the soft tissues of the body and protects the internal organs, may be considered under the subdivisions of the *axial skeleton*, comprising the skull (including the teeth) and the hyoid bone, the spinal column, the ribs, and the sternum or breast bone, and the *appendicular skeleton*, comprising the bones of the limbs together with the bony girdles which support them.

The bones which compose the human skeleton are of three types, *long bones*, for example, the femur or thigh bone, and the humerus or arm bone;



A, skull (*q.v.*), made up of 22 bones; *B*, cervical vertebræ; *C*, sternum or breast bone; *D*, lumbar vertebræ; *E*, clavicle or collar bone; *F*, humerus; *G*, ulna; *H*, radius; *I*, pelvis; *J*, femur; *K*, patella; *L*, tibia; *M*, fibula.

flat bones, for example, the parietal bones of the skull, and the scapula or shoulder blade; and *short* or cubical bones, for example, the trapezium and other small bones of the wrist, and the vertebræ.

If a section is made through a bone it will be found that the bony substance has a different general structure in different parts, being either dense or compact, or open and spongy. The compact bony substance is not, however, abruptly differentiated from the spongy, but they merge gradually into one another, the compact tissue being found on the outer parts of the bone, while the substance becomes more spongy towards the interior.

In long bones there is a shaft of compact tissue with very little spongy tissue, the shaft being hollow in the middle and containing a pulpy substance called the marrow, composed mainly of fat cells, but in certain cases also of cells from which red blood corpuscles are developed, while each end of the bone is enlarged and rounded, being composed of spongy tissue with a thin coating of compact tissue. Flat bones differ in being composed of two layers of compact tissue with a comparatively small amount of spongy tissue between them. Cubical bones, on the other hand, are formed throughout of spongy tissue, with a thin external layer of compact tissue.

The spongy tissue is formed of great numbers of slender bony columns, which join together to form a lattice-work combining great strength with lightness, the strongest of the columns running in the direction in which the greatest strain is experienced. Compact tissue, when examined in transverse section under the microscope, is found to have a great number of little circular orifices, which are the ends of longitudinal channels, containing the arteries and veins for the nourishment of the bone. Around each of these canals the dense bony substance is deposited in concentric rings, and between these rings is a great number of little irregular, star-shaped cavities, communicating with one another and with the canals by minute channels, through which nourishment passes from the canals to the substance of the bone.

Bony substance itself is composed partly of animal or organic matter, and partly of earthy or inorganic matter, blended together in the proportion of about one of the former to two of the latter. By soaking a bone in hydrochloric acid the inorganic matter, which consists of calcium phosphate and small quantities of other calcium, magnesium, and sodium salts, is dissolved out, leaving a gelatinous soft, flexible, organic substance, which preserves the original form of the bone. On the other hand, if a bone is calcined by heat the organic matter disappears, and the inorganic matter remains, white and extremely friable, in the original form of the bone.

The development of bone takes place in a number of stages. It is first represented by membrane, then cartilage is deposited in the membranous tissue, calcification takes place later in the cartilage, and eventually the calcified cartilage is replaced by true bone. Certain bones of the skeleton, including the bones of the vault of the skull and of the upper part of the face, skip the cartilage stage, the bony substance developing directly from membrane. A cartilage stage is, however, present in the development of most of the bones of the skeleton.

In the process of change from cartilage to bone the cartilage cells enlarge, calcification takes place between the cells by the depositing of lime salts, and minute blood-vessels extend from the periphery into this area. With the blood-vessels come certain specialised cells. Some of which build up bone, and others which break down bone; the former cause the formation of bone on the foundation of the calcified cartilage, while the latter absorb the bone formed in the centre, thus producing the central cavity of a bone, the processes of formation and absorption proceeding side by side. It is in this way that a bone grows in thickness, growth taking place from the investing membrane of a bone, in the deeper part of which is a layer of bone-building cells.

In a typical long bone there is a centre from which bone develops in the cartilage at each extremity as well as in the shaft, and as bone formation goes on, the shaft grows towards each extremity, and at the same time each extremity grows towards the shaft. Between each extremity and the shaft there is a layer of cartilage into which numerous blood-vessels extend from these active bone-forming areas, and in consequence of this excellent nutrition the layer of cartilage is also very active in growth. It is in this way that a bone grows in length. At a certain period of its growth calcification takes place in the intervening layers of cartilage, bone then develops, and longitudinal growth of the bone stops.

The adult **skull** is composed of twenty-two bones, eight of which take part in the formation of the *cranium* or brain box, and fourteen in the formation of the skeleton of the face. The bones are joined together by a sort of dove-tailing or morticing jointing arrangement of their uneven edges; but at birth there are six spaces (*fontanelles*, "little fountains") between the bones, in at least one of which pulsations, almost fountain-like, can be observed. In old age the jointing tends to ossify, so that the skull becomes a shell.

The *frontal bone* is a shell-shaped bone extending across the forehead, from one side of the skull to the other, forming also the upper parts of the orbits. The two parietal bones are quadrilateral and convex, forming the lateral walls of the cranial vault. The *temporal bones* are placed at each side of the skull in the region of the ear, composed of a thin, sharp-edged portion which forms part of the wall of the cranium, a hard portion which contains in its interior the internal ear and the outer part of which is the prominent mastoid process behind the ear, and a tympanic portion, circular and forming the walls of the external opening of the ear. The *occipital bone* is fan-shaped, and is placed at the back and base of the skull, and through a large circular opening, the *foramen magnum*, in its base the spinal cord and vertebral arteries pass. The *sphenoid bone* takes part in the formation of the base of the skull, being placed in front of the occipital, its prominent wings at each side form part of the cranial wall between the frontal and temporals, while other plate-like processes form part of the orbits and the nasal cavity. The *ethmoid bone* is very light, composed of two spongy lateral masses joined to a central vertical plate, taking part in the formation of the walls of the nasal cavity, while its sharp crest passes through an opening in the frontal bone and rises up in the interior of the cranium.

The bones of the face surround the cavities of the nose and the mouth and take part, in conjunction with certain bones of the cranium, in the formation of the cavities of the orbits. The two *nasal bones* are little plate-like bones at the root of the nose between the nasal processes of the superior maxillæ. The two *superior maxillary bones* have a cubical body containing an air-sinus, with a prominent lower border in which the teeth of the upper jaw are set, a projection upwards, the *nasal process*, which forms the side of the nose, a process inwards to form the hard palate, and a smooth surface presented upwards to form part of the floor of the orbit. The two *malar bones*, crossing from the superior maxillæ to the temporals, form the prominences of the cheeks and the outer parts of the orbits. The two *lachrymal bones* are little bones forming part of the inner walls of the orbits. The two *inferior turbinated bones* are thin spongy bones joining the lateral parts of the ethmoid and forming part of the outer walls of the nasal cavity. The *vomer* is a sharp-edged triangular bone dividing the posterior part of the nasal cavity in two. The two *palate bones* form the posterior part of the outer walls of the nasal cavity and the posterior part of the hard palate. The *inferior maxillary bone*, or *mandible*, is horse-shoe shaped, with prominent, flat, upturned ends or rami, which articulate at each side with the temporal bones, forming a hinge-like joint, while the upper border of the front horizontal part or body of the bone is armed with the teeth of the lower jaw.

All the bones of the skull, with the exception of the mandible, which forms a loose acting joint with the temporal bones, articulate with one another by *sutures*, many of which become completely ossified in adult life and disappear.

The **teeth** are the organs which divide and grind down the food so that it can be easily swallowed, and they are situated on the adjacent borders of the superior and inferior maxillary bones. They are developed not from bone but from the same tissue as the true skin, but, usually forming part of the skeleton, they may be conveniently considered here.

In regard to structure the body of a tooth is formed of a somewhat hard substance termed *dentine*, composed of minute tubules containing earthy matter, closely packed together; the dentine body is hollow, the cavity being called the *pulp cavity*, and contains minute arteries, veins, and a branch of the nerve which supplies the teeth. Covering the dentine in the region of the root of the tooth, contained within the gum, is a layer of *cement*, which protects the lower part of the body, while covering the body of the tooth in the region of the crown, outside the gum, is a layer of *enamel*, which is the hardest tissue in the human body, composed almost entirely of earthy matter, enabling the tooth to carry out effectively its function of cutting up or grinding the food.

There are several different types of teeth, which are adapted for different purposes. The *incisors* are for the purpose of cutting the food, and have a single root and a somewhat thin vertical crown which is bevelled behind so as to present a sharp cutting edge. The *canines* are for tearing the food and are highly developed in carnivorous animals, such as the dog; they have a single deep root and a rounded, pointed crown. The *premolars* or *bicuspids* have single or sometimes two roots, and a rather square crown on which are two slight projections. The *molars*, with the premolars, are for the purpose of grinding down the food; they are much larger than the other teeth, have from two to five roots which are comparatively short, and have square crowns on which are from three to five projections or cusps.

A child has only twenty teeth, called the "milk teeth," which begin to appear at the age of six months and persist till about the age of seven years, when they begin to fall out and to be replaced by the permanent teeth. An adult has thirty-two teeth, comprising, from before backwards, in each half of each jaw, two incisors, one canine, two premolars, and three molars.

The *hyoid bone* lies in the front of the neck between the mandible and the larynx and is a horseshoe shaped bone with a small *body* and arching *wings*, two prominences on the upper surface at the extremities of the body being called the *lesser* wings. It is attached to the *styloid* process of the temporal bone by a strong ligament which may become ossified in late adult life.

The **spinal** or **vertebral column** is composed originally of thirty-three vertebræ, but in the adult the first twenty-four vertebræ remain separate, the next five join together to form the *sacrum*, which is part of the bony girdle of the pelvis, and the last four fuse more or less completely to form the *coccyx*. The upper seven separate vertebræ are termed the *cervical*, the next twelve, with which the ribs articulate, the *thoracic* or *dorsal*, and the lower five the *lumbar*.

The vertebræ differ in structure in the different regions of the spinal column, but their main characteristics are the same. Each possesses a cylindrical body which is united by discs of cartilage to the bodies of the vertebræ immediately above and below. From the body, on its outer side, are thrown off two bony projections which meet to form a canal for the spinal cord. The bone of the canal has three projections on its outer side, one in the centre (*spinous process*, whence comes the term spinal column) forming the spring ridge of the back bone, and one on each side (*transverse processes*). Above and below the last named are other projections which interlock with those of the adjacent vertebræ.

The *cervical vertebræ* differ from the others by their transverse processes being pierced by a hole, while their bodies have an oblong shape and their spinous processes are split through the middle. The first cervical vertebra, or *atlas*, is in the form of a ring, the usual body being quite absent, and upon its large, rather horizontal facets, the skull rests. The second cervical vertebra, or *axis*, has a pointed vertical prolongation of its body which passes through the ring of the atlas and is held in place by strong ligaments, acting as a pivot for many of the movements of the head. The *thoracic* or *dorsal vertebræ* are characteristic in having joint depressions on the sides of their bodies for articulation with the heads of the ribs, and excepting the eleventh and twelfth they have tiny hollows also on their transverse processes to support the ribs, while their bodies are somewhat heart-shaped, and their spinous processes prominent and oblique.

The *lumbar vertebræ* have large kidney-shaped bodies, spade-like spinous processes, and large and prominent jointing projections.

The *sacrum*, formed by the conjunction of five vertebræ, is of a somewhat triangular shape, presenting a slightly concave anterior and a slightly convex posterior surface. The anterior surface is smooth and forms the posterior wall of the basin of the pelvis, while the posterior surface is rough, with a prominent crest composed of the spinous processes of the component vertebræ. Through the four pairs of openings in its body various nerve trunks emerge.

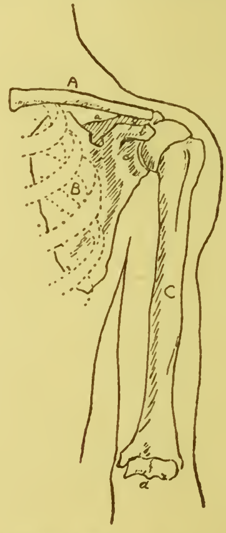
The *coccyx*, formed by the fusion of four terminal vertebræ, is triangular in shape and articulates with the lower end of the sacrum.

The ribs, twelve pairs in number, are flat, elastic bones, curved in the form of an arch, and compose a protecting framework for the chest. Each pair of ribs articulates behind with one of the thoracic vertebræ. In front the first seven pairs are connected by bars of cartilage, the *costal cartilages*, with the sternum or breast bone, and are called the *true ribs;* the lower five pairs are called the *false ribs*, the first three of them being attached by bars or plates of cartilage to the ribs above, but not to the sternum, while the last two, or *floating ribs*, are free in front.

A typical rib has a wedge-shaped *head*, articulating with a facet on the side of the body of a vertebra, behind which is a somewhat narrow *neck;* beyond the neck, projecting backwards, is a *tuberosity*, which articulates with the transverse process of its vertebra, while the curved shaft is thin and flat with sharp edges, bending sharply towards the back, at the *angle*. The first rib is shorter, wider, and flatter than the others, while the eleventh and twelfth ribs are short, with very slight curves and pointed ends.

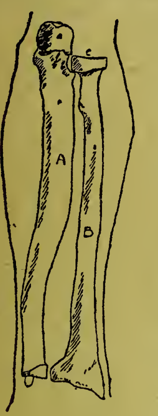
The *sternum*, or breast bone, is placed in the middle of the upper part of the chest. It consists of three portions, the *manubrium*, the upper, flat, and somewhat square portion, the *gladiolus*, the middle, flat, and rather elongated portion, and the *ensiform process*, which is short, pointed, and cartilaginous. The clavicles and the costal cartilages of the first pair of ribs are attached to the manubrium, and the costal cartilages of the next six pairs of ribs to the gladiolus.

The **Appendicular Skeleton.**—The *upper limb* may be divided into the shoulder, the upper arm,



SHOULDER AND UPPER ARM.—*A*, clavicle; *B*, scapula: *a*, *a*, acromion, *b*, coracoid, *c*, glenoid; *C*, humerus: *d*, surface for articulation with ulna and radius.

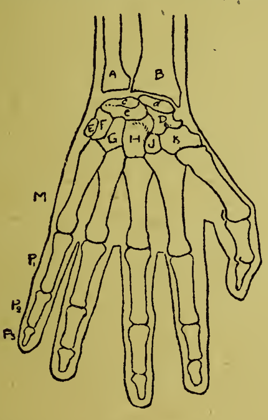
the forearm, and the hand. The skeleton of the shoulder comprises two bones. The *clavicle*, or collar bone, stretches from the scapula to the sternum, with both of which it forms joints; it has a curved shaft, concave in its outer third and convex in its inner two-thirds, and is thick and somewhat triangular in section at the sternal and flattened at the scapular end. The *scapula*, or shoulder blade, is a flat, triangular bone, with a prominent spine projecting right across its posterior aspect and ending in a broad process called the *acromion*, which articulates with the clavicle, while from the edge slightly lower than the acromion and more towards the outer side of the scapula juts a curved projection, the *coracoid*, the articular cup to receive the humerus, the *glenoid fossa*, lying below and between the processes.



FOREARM.—*A*, ulna: *a*, olecranon; *b*, coronoid; *B*, radius: *c*, surface for articulation with humerus; *d*, surface for articulation with wrist.

The *humerus* is the sole bone of the upper arm; it is a long bone with a rounded shaft, an upper extremity with a convex articular surface and two prominent tuberosities, and a flattened lower extremity with a partly grooved, partly rounded, articular surface at its lowest part, a tuberosity or *condyle* at each side, and a deep hollow behind, into which the olecranon process of the ulna fits, on extension of the arm.

The skeleton of the forearm consists of two bones. The *radius* lies on the outer side, a long bone with a shaft which is sharp on the inner side and rounded on the outer, a cup-like articular head or upper extremity, below which is a tuberosity, and a broad lower extremity, articulating at its lower surface with the bones of the wrist. The *ulna*, which lies



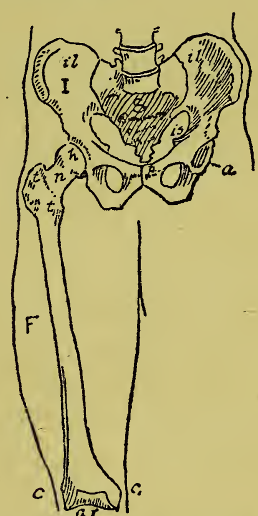
WRIST AND HAND.—*A*, ulna; *B*, radius; *C*, semilunar articular surface; *D*, scaphoid articular surface; *E*, pisiform; *F*, cuneiform; *G*, unciform; *H*, os magnum; *I*, trapezoid; *K*, trapezium; *M*, metacarpals; P_1, P_2, P_3, phalanges.

on the inner side, is also a long bone, the shaft having two surfaces with sharp edges; the upper extremity has a deep notch on the front for articulation with the humerus, and one prominent tuberosity above and behind, the *olecranon*, while there is another below and in front, the *coronoid*; the lower extremity is circular and disc-like, articulating with the lower end of the radius and the triangular fibro-cartilage of the wrist, and having a prominent styloid process behind.

The bones of the wrist are eight in number, arranged in two rows—the *scaphoid* (bean-shaped), *semilunar* (half-moon shaped), *cuneiform* (irregularly pyramidal), and *pisiform* (like a pea), above, and the *trapezium* (with a prominent ridge), *trapezoid* (L-shaped, the second smallest), *os magnum* (the largest), and *unciform* (with a prominent hook) below. With the exception of the pisiform, which is the smallest and rests upon the front of the cuneiform, all these bones are irregularly six-sided, rough on their palmar and dorsal surfaces for the attachment of ligaments, and with smooth surfaces where they are in contact with other bones.

The skeleton of the palm of the hand consists of five *metacarpal bones*, each of which is a miniature long bone with a shaft and two extremities, the metacarpal of the thumb being shorter and thicker than the others.

The *phalanges*, or bones of the fingers, resemble the metacarpals in form and in structure They are three in number in each finger except in the thumb, which has only two, the proximal and the distal. The distal phalanges are the smallest and have spade-shaped tuberosities at the heads to support the finger-nails.



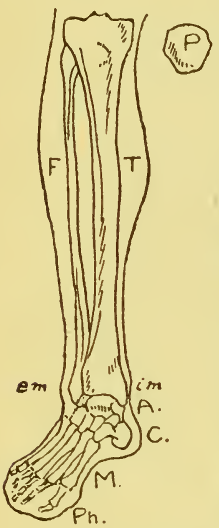
LOWER LIMB.—*S*, sacrum; *I*, innominate bone: *il*, ilium; *is*, ischium; *p*, pubis, *a*, acetabulum; *F*, femur: *h*, head, *n*, neck, *tt*, trochanters, *cc*, condyles, *ar*, articular surface.

The *lower limb* may be divided into the haunch, the thigh, the leg and the foot. The bone of the haunch, or *innominate bone*, forms the greater part of the bony girdle of the pelvis, the innominate bone of each side joining the sacrum behind and articulating with its fellow of the opposite side at the *symphysis pubis* in front. It is an irregular, curved, flat bone, consisting in its earlier stages of development of three bones, the *ilium*, a broad, bony plate, the *ischium*, a curved bar of bone, and the *pubis*, an L-shaped bar of bone with an ascending and a descending branch. These three parts, which join together at the *acetabulum* or socket of the hip joint, only unite completely to form the innominate bone about the twenty-third to twenty-fifth year of life.

The thigh has a single bone, the *femur*, which is a long bone, the largest bone, indeed, of the body, with a smooth, rounded shaft; the upper extremity consists of a rounded convex head which articulates with the acetabulum of the innominate bone, joined to the shaft by a neck, two prominent tuberosities or *trochanters* being situated at the junction; the lower extremity has, behind, a large tuberosity on each side, the *condyles*, and in front and below is a smooth articular surface which takes part in the formation of the knee joint.

In front of the lower extremity of the femur is a small triangular flat bone called the *patella* or knee cap, developed in the tendon of the extensor muscles on the front of the thigh, its posterior surface being smooth and forming part of the knee joint.

The skeleton of the leg consists of two bones. The *tibia* has a shaft with three surfaces and sharp borders, a broad, flat, articular upper extremity which has a tuberosity on each side of it, the external with a smooth surface to articulate with the fibula, and the lower extremity with a smooth articular surface below, while it is prolonged into a prominence, the *internal malleolus*, on its inner side. The *fibula* is a thin, slender, long bone, with a ridged shaft for the attachment of various muscles, a small smooth surface on the upper extremity to articulate with the tibia, and a prominent lower extremity which forms the *external malleolus*, having a smooth articular surface on its inner side.



Leg.—*P*, patella; *T*, tibia: *im*, internal malleolus; *F*, fibula: *em*, external malleolus; *A*, astragalus; *C*, os calcis; *M*, metatarsals; *Ph*, phalanges.

The bones of the ankle are seven in number, arranged in three rows. The row nearest the leg consists of the *astragalus*, which is a large irregular bone presenting a saddle-shaped smooth surface for articulation with the bones of the leg; and the *os calcis*, upon which the former rests, the largest of the tarsal bones, with a prominent tuberosity at the heel. The middle row consists of the *scaphoid*, an irregular bean-shaped bone. The distal row includes the *cuboid* (deriving its name from its shape and having a prominent tuberosity), the *external cuneiform* (wedge-shaped) and *middle cuneiform* (also wedge-shaped and rather smaller), and the *internal cuneiform* (the largest of the three, somewhat curved, and rather less typically wedge-shaped).

The skeleton of the anterior part of the foot consists of five *metatarsal bones*, resembling in form the metacarpals of the hand, but longer, more slender, and with the bases more prominent.

The *phalanges* of the toes resemble the similar bones of the fingers, differing, however, in that the middle and distal phalanges of the toes are very much smaller in proportion to the first phalanx than are those corresponding of the fingers.

MUSCULAR SYSTEM

The functions of the muscles of the body are to bring about the movements of the different parts and to exert force when required, both of which functions are under the control of the mind. Muscle tissue is composed of elongated cells, termed muscle fibres, and consists of three different types, striated or voluntary, non-striated or involuntary, and heart muscle. In striated or voluntary muscle the fibres are arranged in bundles enclosed in delicate membranous sheaths, and each fibre has alternately layers of dark and light material, giving it a transversely striated appearance. Muscle of this type constitutes the fleshy part of the body. A voluntary muscle is typically made up of a central fleshy mass covered with a membranous sheath or aponeurosis, and with a tendinous part of fibrous tissue at each end by which it is attached to bone, or, less commonly, to cartilage, fascia, or skin. Each muscle is supplied by one or more nerves through which it is controlled by the brain, and by blood-vessels and lymphatics, for the purpose of its nourishment.

The fibres of non-striated or involuntary muscle have fine longitudinal but no transverse markings, and they are extremely long and narrow. Non-striated muscle constitutes a great part of the walls of the alimentary canal, blood-vessels, uterus, bladder, and is also found in the skin; muscle of this type is not under the control of the mind. Heart muscle is likewise independent of the control of the mind, and is composed of somewhat rectangular cells, branching at the ends, with transverse markings hardly so distinct as those of voluntary muscle fibres.

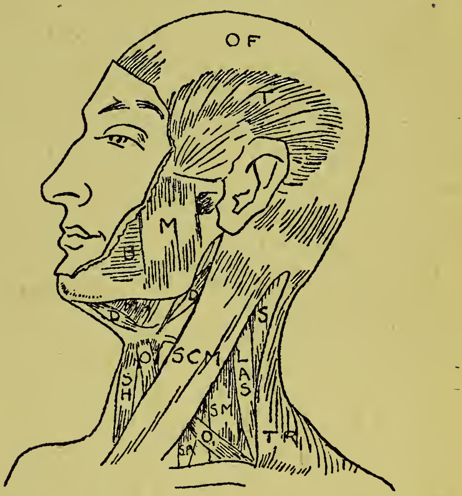
The voluntary muscles are of various shapes, fusiform, conical, flattened into quadrilateral, triangular, or ribbon-like sheets, or circular, surrounding openings which they constrict, and they are also of widely different sizes. They are named in various ways, from their position, e.g. *temporal*, from their direction, e.g. *external oblique*, from their attachments, e.g. *sterno-cleido-mastoid*, from their shape, e.g. *deltoid* (from the Greek letter Δ, delta), or from their uses, *e.g. extensor longus digitorum.* Between the skin and the muscles there are two layers of tissue, that next the skin being termed the *superficial fascia*, and the lower the *deep fascia.* The superficial fascia is a sheet of fatty connective tissue underneath the skin all over the body, in which lie the cutaneous blood-vessels and nerves. The deep fascia is a fibrous membrane, likewise all over the body, closely investing the ligaments and muscles, projections from it forming divisions between groups of muscles. In the neck there is a muscular sheet, termed the *platysma myoides*, between the superficial and the deep fascia, which is the rudimentary form in man of an additional muscular layer which is developed to a greater extent in certain of the lower animals.

The most characteristic property of muscle is its power of shortening when stimulated, or its contractility. When a muscle is stimulated there is a change in the elasticity in the component muscle cells and the points of attachment of each cell to its neighbouring tissue elements yield to the strain put upon them, the diameter of the cell between these points diminishing while the other diameter is increased, the volume of the cell thus remaining the same. There is also a chemical change in the muscle, marked chiefly by the production of sarcolactic acid, while carbon dioxide is also produced. The exhaustion which follows prolonged activity on the part of a muscle is due to the accumulation of these waste products in it, and they are eventually removed by the lymph.

The stimulus which causes muscular contraction may be mechanical, chemical, or electrical, but normally contraction is due to the influence of the nerves distributed to the muscles, which are controlled by the brain. Movements of the voluntary muscles may be made involuntarily when certain impressions are made either internally or externally on the surface of the body, as, for instance, when the foot is moved involuntarily in response to the stimulus of tickling the sole. The stimulus given by the impression travels up the afferent nerve fibres to their nerve cells in the anterior horn of grey matter in the spinal cord. (see Nervous System), and they in return transmit an impulse along the efferent nerve fibres to the muscles, which then contract. This process is termed *reflex action.* In voluntary action the stimulus comes from the nerve cells of the brain which control the action of the muscles. These nerve cells are situated in a particular area of the grey matter of the cortex of the brain, termed the motor area (see *Brain*), the area governing the leg being at the upper end of the præcentral convolution, then comes the trunk area, the arm area lower but still above the middle, then the neck area, the face area lower still, and the tongue area lowest. Disease of any part of the motor area causes paralysis of the corresponding muscles. The stimulus is sent down the nerve fibres to the nerve cells in the spinal cord, whence the impulse is transmitted to the muscles. The spinal nerves are attached to the spinal cord by two roots, of which the anterior contains the nerve fibres which convey impulses to the muscles, termed the motor nerve fibres, while the posterior contains the nerve fibres which carry the stimuli of impressions upon the sense organs, termed the sensory nerve fibres.

The Muscular System may be divided into the *axial* and the *appendicular* muscles, the former including the muscles of the head, face, and trunk, and the latter the muscles of the arms and legs.

The **muscles of the head and face** may be considered under superficial muscles, muscles of mastication, and muscles of the orbit. The superficial muscles include, first, the *platysma myoides,* situated between the superficial and deep fascia in the neck and extending from the chest to the face. Second, the muscles of the scalp, comprising the *occipito-frontalis,* stretching from the back of the skull in a thin sheet over the vertex to the forehead, causing wrinkling of the skin of the forehead when it contracts: the *retrahens, attolens,* and *attrachens,* muscles of the ear, which are small, thin, rudimentary muscles situated at the side of the skull respectively behind, above and behind, and above and in front of, the ear. Third, the muscles of the face, including the superficial muscles of the eyelids, the most important of which is the *orbicularis palpebrarum,* which is an oval muscle covering the opening of the orbit and forming the upper and lower eyelids ; the muscles of the nose, which are five little feeble muscles taking part in the movements of the nose, and one which in addition has a share in the movements of the upper lip ; the muscles of the mouth, which consist of eleven muscles, all but one being found on each side of the mouth. Of these the *levator labii superioris alœque nasi,* the *levator labii superioris,* the *levator anguli oris,* and the *zygomatici major* and *minor* are muscular slips coming from above to the mouth,



Muscles of the Head and Neck.—*OF*, occipito-frontalis; *T*, temporal; *M*, masseter; *B*, buccinator; *D*, degastric; *MH*, mylo-hyoid; *SH*, sterno-hyoid; *O*, omohyoid; *SCM*, sterno-cleido-mastoid; *SA*, scalenus-anticus; *SM*, scalenus medius; *LAS*, levator anguli scapulæ; *S*, splenus; *TR*, trapezius.

the *visorius* comes horizontally to the angle of the mouth, while the *depressor anguli oris* and the *depressor labii inferioris* come from below to the mouth, and the *levator menti* is a slight muscular slip inserted into the skin of the chin.

The *orbicularis oris* is an oval sphincter (*i.e.* able to close a natural opening) muscle which surrounds the margins of the mouth, forming the lips, while the *buccinator* is below the other muscles and forms the side wall of the mouth. The different emotions are expressed by the contraction or inactivity of different sets of the above muscles. The muscles of the orbit (eye) are seven in number, one of which, the *levator palpebrœ superioris,* acts upon the upper eyelid, while the other six act upon the eyeball. The *levator palpebrœ superioris* has its origin at the upper margin of the optic opening, by which the optic nerve enters the orbit, and passes forward as a narrow muscular band above the *rectus superior* muscle and above the eyeball to expand into a broad insertion in the upper part of the *orbicularis palpebrarum* and in the skin of the upper eyelid and the tarsal cartilage. There are four recti muscles, *superior, inferior, external,* and *internal,* respectively above, below, external to, and internal to, the eyeball, all of which arise from a membrane surrounding the optic opening, the *superior* and *inferior recti* and the upper head of the *external rectus* arising from the upper part of the membrane termed the *superior common tendon,* and the *internal* and *inferior recti* and the lower head of the *external rectus* arising from the lower part of the membrane, termed the *inferior common tendon.* The four muscles proceed as flattened bands around the optic nerve and over the eyeball and are inserted into the sclerotic membrane of the eyeball in its anterior half. The *superior oblique* muscle is likewise a muscular band, which arises between the superior and internal recti at the margin of the optic opening and passes along the inner side of the orbit to the front, where its tendon passes through a fibrous pulley and, forming an acute angle, passes outwards and backwards to be inserted in the sclerotic membrane below the superior rectus. The *inferior oblique* arises from the floor of the orbit at its inner side at the front, curves round the inferior rectus and is inserted in the sclerotic membrane below the external rectus.

The action of the muscles of the orbit consists in moving the eyeball upwards, downwards, outwards, and inwards, or rotating it on its own axis; the *levator palpebræ superioris* acts in antagonism to the *orbicularis palpebrarum* and elevates the upper eyelid.

The **muscles of mastication** include the *masseter* muscle, which arises from the *zygoma,* or bony bridge formed by the junction of projections from the temporal and malar bones, and is a quadrilateral muscle with a broad insertion on the outside of the ramus of the lower jaw, above the angle, forming the hinder part of the cheek. The *temporal* muscle is a triangular-shaped muscle which arises from practically the whole of the side of the skull and converges to be inserted on the inner side of the coronoid process of the lower jaw. The *external* and *internal pterygoid* muscles are covered by the lower jaw, the *zygomatic* process, and the *masseter* and *temporal* muscles, the *external pterygoid* coming from the great wing and external pterygoid plate of the sphenoid bone and being inserted below the condyle of the lower jaw and in the capsule of the joint between the lower jaw and temporal bone, while the *internal pterygoid muscle* comes from the inner surface of the external pterygoid plate of the sphenoid, and also from the palate bone and upper jaw, to be inserted on the inner aspect of the lower jaw at the angle of the jaw. The *buccinator,* which has already been described with the muscles of the face, is also one of the muscles of mastication.

The **muscles of the neck** include a group comprising the *complexus muscle* arising by slips from about the upper six thoracic and lowest four cervical vertebræ and extending as a muscular band to the occipital bone where it has an area of insertion of considerable extent; the *trachelo-mastoid* muscle arises by slips from the same vertebræ as the complexus and is inserted on the mastoid process; and the *transversalis cervicis,* which arises from the six uppermost thoracic vertebræ, and is inserted in from the second to the sixth cervical vertebræ. Another group comprises the small muscles which form the boundaries of the suboccipital triangle at the back of the neck, the *rectus capitis posticus major* and *minor,* the former arising from the spine of the axis and inserted on the occipital bone midway between the upper part of the foramen magnum and the edge of the bone, and the latter arising from the spine of the atlas and inserted on the occipital bone internal to the insertion of the former; the *obliquus superior* arises from the transverse process of the atlas and is inserted on the occipital bone external to the insertion of the *rectus capitis posticus major,* while the *obliquus inferior* goes from the spine of the axis to the transverse process of the atlas; the *rectus capitis lateralis* has its origin on the transverse process of the atlas, and is inserted on the process of the occipital bone which bounds the opening by which the internal jugular vein leaves the skull. The above groups of muscles are concerned in the movements of the head at the joint between the atlas and the occipital bone, flexion and extension, and those at the joint between the atlas and the axis, lateral movement and rotation.

The **muscles in front of the vertebral column** comprise the *rectus capitis anticus major* and *minor,* which arise respectively from the third to the sixth cervical vertebræ, and from the anterior arch of the atlas, the former being inserted at the anterior margin of the basilar process of the occipital bone, and the latter on the basilar process behind the insertion of the former muscle; the *longus colli* is composed of a series of muscular slips and is divided into three parts, the *vertical* part arising from the three first thoracic and the three last cervical vertebræ and extending up to be inserted in the second, third, and fourth cervical vertebræ, the *lower oblique* part arising from the three first thoracic vertebræ and extending to the fifth and sixth cervical vertebræ, while the *upper oblique* part extends from the third, fourth, and fifth cervical vertebræ to the anterior tubercle of the atlas. There is a group of muscles extending from the front of the vertebral column to the ribs, comprising the *scalenus anticus,* a muscular band arising from the third to the sixth cervical vertebræ and inserted at the middle of the upper side of the posterior margin of the first rib, the *scalenus medius,* arising from the second to the sixth cervical vertebræ and inserted at the posterior half of the first rib, while the *scalenus posticus* arises from the fourth, fifth, and sixth cervical vertebræ and is inserted on the second rib about the junction between the middle and posterior thirds of the rib.

The *sterno-cleido-mastoid* muscle is a prominent muscular band at the side of the neck, more visible when the head is drawn to the opposite side, which arises partly from the upper part of the sternum, or breast bone, and partly from the clavicle, and, stretching across the neck, is inserted on the mastoid process and on the margin of the occipital bone.

There is a group of **muscles associated with the hyoid bone.** The *omo-hyoid* is composed of two muscular bellies with a central tendon, the posterior belly arising from the upper border of the scapula and going obliquely forwards to the central tendon, which is situated below the *sterno-mastoid muscle,* while the anterior body stretches from the central tendon to the body of the hyoid bone. The *sterno-hyoid muscle* has its origin on the sternal end of the clavicle and on the cartilage of the first rib and extends to the body of the hyoid bone. The sterno-thyroid muscle arises from behind the upper part of the sternum and from the cartilage of the first rib, and proceeding upwards beneath the omo-hyoid and sterno-hyoid muscles, is inserted on the thyroid cartilage of the larynx. Continuing in the same direction as the sterno-thyroid muscle, the *thyro-hyoid* goes from the thyroid cartilage to the body and wing of the hyoid bone.

Another group of muscles is situated between the hyoid bone and the skull. The *digastric* muscle is composed of two muscular bellies with an intermediate tendon, the posterior belly arising from a groove beneath the mastoid process and passing downwards and forwards to the hyoid bone; here the central tendon passes under a fibrous band attached to the hyoid bone, which acts as a pulley, and from the tendon the anterior belly of the muscle goes upwards and forwards to be near the middle of the lower border of the lower jaw. The *stylo-hyoid* muscle is composed of two muscular slips which arise from the styloid process of the temporal bone, and passing downwards and forwards, one slip on each side of the posterior belly of the digastric are inserted on the body of the hyoid bone. The *mylo-hyoid* muscle arises from a ridge which passes diagonally across the inner side of the lower jaw, and goes downwards and forwards to the body of the hyoid bone, while between the hyoid bone and the jaw the muscle from each side joins the other, forming a floor for the mouth. The *genio-hyoid* muscle comes from a tuberosity on the back of the lower border of the lower jaw, and, going downwards and towards the back, is inserted on the body of the hyoid bone.

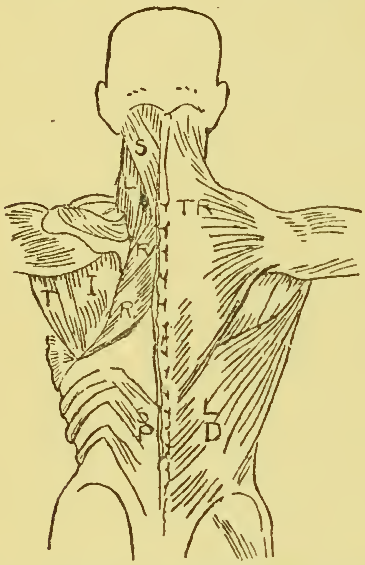
The **muscles of the tongue** consist of two sets, the extrinsic muscles, arising from the hyoid bone, styloid process, lower jaw and soft palate, and inserted, partly or wholly, in the tongue, and the intrinsic muscles, which compose the body of the tongue itself. The extrinsic muscles include the *genio-hyo-glossus,* arising from a tubercle above the origin of the genio-hyoid on the lower margin of the lower jaw, and inserted partly on the body of the hyoid bone, and partly in the tongue, from the base to the tip; the *hyo-glossus,* a somewhat square muscle which arises from the hyoid bone and is inserted at the side of the tongue; the *stylo-glossus,* arising from the end of the styloid process and inserted beneath and at the side of the tongue; the *palato-glossus,* which is a thin sheet of muscle arising from the lower surface of the soft palate, and inserted at the side of the tongue. The intrinsic muscles of the tongue include the *superior lingualis,* extending on the upper surface from base to tip, the *inferior lingualis,* on the under part on each side of the tongue, the transverse muscular fibres arising in the middle and extending to the upper surface and the sides, and the vertical muscular fibres, arising from the upper surface of the tongue and extending downwards and outwards.

The **pharynx** is enveloped in a muscular wall composed of an internal longitudinal layer consisting of the *stylo-pharyngeus* and *palato-pharyngeus* muscles, and an external circular layer, consisting of the *superior, middle,* and *inferior constrictor* muscles. The *stylo-pharyngeus* arises at the root of the styloid process, and, going downwards between the internal and external carotid arteries, passes through between the superior and middle constrictor muscles, and is inserted on the thyroid cartilage. The *palato-pharyngeus* arises from the back of the hard palate and consists of two layers which enclose the *levator palati* and *azygos uvulæ* muscles between them, and spreading out its fibres are inserted on the thyroid cartilage, and, as far down as the lower border of the *inferior constrictor* in the sheath of the pharynx. The *superior constrictor* is a fan-shaped muscle arising from the inner aspect of the lower jaw just behind the last molar, from the internal pterygoid plate and from the pterygo-mandibular ligament, and spreads backwards to join the fibres coming from the other side and also to an insertion on the occipital bone. The *middle constrictor* muscle arises from the wings of the hyoid bone and from the stylo-hyoid bone, and spreads backwards to meet the fibres coming from the other side, the upper fibres of the muscle overlapping the lower part of the *superior constrictor,* while the lower fibres are overlapped themselves by the upper part of the *inferior constrictor.* The *inferior constrictor* muscle arises from the thyroid and cricoid cartilages, and, like the other constrictors, spreads backwards to meet the fibres coming from the opposite side, overlapping the middle constrictor above, and being blended with the muscular wall of the œsophagus below.

The soft palate and uvula are formed of five pairs of small muscles; the *palato-pharyngeus,* beside forming part of the internal layer of the muscles of the pharynx, is attached to the posterior border of the hard palate and forms two muscular layers on the soft palate, between which the *levator palati* and *azygos uvulæ* muscles are enclosed; the *levator palati* arises from the under surface of the tip of the hard portion of the temporal bone, and from the cartilaginous portion of the Eustachian tube, and it is inserted in the soft palate, partly blending with the corresponding muscle of the opposite side; the *azygos uvulæ* arises from the soft palate and from the posterior nasal spine and ends in the uvula; the *tensor palati* arises fron the sphenoid bone and from the cartilaginous portion of the Eustachian tube and descends behind the *internal pterygoid muscle,* to be inserted into the posterior border of the hard palate and into the soft palate; the *palato-glossus* muscle, which is one of the extrinsic muscles of the tongue, arises from the soft palate occupying its under surface, and is inserted at the side of the tongue.

The muscles of the pharynx and soft palate are employed in swallowing, the tongue, hyoid bone, and thyroid cartilage being raised upwards one after the other by the action of the muscles which close the mouth and move the hyoid bone upwards. The muscles of the pharynx and soft palate at the same time contract, bring the soft palate closely in contact with the posterior wall of the pharynx and so shut off the nasal cavity. Simultaneously the epiglottis is raised by the raising of the tongue, hyoid bone, and larynx, and by its elevation combined with the contraction of the muscles of the larynx the air passages are shut off. The food thus glides over the back of the epiglottis into the pharynx, where the constrictor muscles contract upon it and force it down into the œsophagus.

The **muscles of the back** include several groups of muscles, the first group comprising those muscles which connect the arm with the trunk. The *trapezius* is a large triangular muscular sheet in the upper part of the back, and at the back of the neck, arising from the superior curved line of the occipital bone, the external occipital protuberance, the strong ligament which stretches along the spines of the cervical vertebræ, termed the ligamentum nuchæ, and from all the dorsal vertebræ; converging from above and from below this muscle is inserted in the outer half of the clavicle, and the acromion process and spine of the scapula. The



Muscles of the Back.—*S*, splenius capitis; *L*, levator anguli scapulæ; *TR*, trapezius; *RR*, rhombhoidei; *I*, infraspinatus; *T*, teres major; *SP*, serratus posticus; *LD*, latissimus dorsi.

latissimus dorsi is a large triangular muscular sheet in the lower part of the back which arises from a thick membrane or aponeurosis which is attached to the last half-dozen dorsal and all the lumbar vertebræ, and to the sacrum and the crest of the ilium, some muscular fibres of the muscle also arising from these attachments; some muscular slips also take origin from the four lowest ribs, while another slip arises from the lower angle of the scapula; the muscle proceeds upwards and outwards, growing gradually narrower, and, winding over the lower end of the scapula, forming the fleshy fold at the posterior border of the axilla or armpit, it is inserted on the humerus for two or three inches below the lesser tuberosity. The *levator anguli scapulæ* is a muscular band arising by slips from the upper four cervical vertebræ, and, proceeding downwards at the side of the neck, is inserted on the edge of the scapula, at the superior angle and as far along the vertebral border as the root of the scapular spine. The *rhomboideus minor* is a muscular band which arises from the seventh cervical and first dorsal vertebræ and, proceeding outwards and downwards, is inserted on the vertebral border of the scapula at the root of the scapular spine. The *rhomboideus major* has the same direction as the rhomboideus minor with which it is frequently combined, and, arising from the second to the fourth or fifth dorsal vertebræ, is inserted along the vertebral border of the scapula from the root of the scapular spine almost to the inferior angle. This group of muscles acts in concert with the muscles of the chest which connect the arm to the trunk in front, and also with the sterno-mastoid and omo-hyoid muscles which have a share in connecting the arm in front with the skull and hyoid bone respectively, and enable the shoulder to move in an arc from the sterno-clavicular joint, and also they rotate the scapula on the clavicle at the acromio-clavicular joint, thus changing the direction in which the shoulder joint points. In deep, forced breathing, these muscles raise the bony girdle of the shoulder and at the same time those which are attached to the ribs pull up the ribs and so expand the chest. Movement from side to side and rotation of the spine in the region of the neck is assisted by the *trapezius*, *levator anguli scapulæ*, and *rhombodei major* and *minor*. The *trapezius* and *latissimus dorsi* pull the arm to the side and at the same time rotate the arm, through their insertions on the humerus.

Another group is situated immediately beneath the first group, being concealed by them. The *serratus posticus superior* is a thin muscular sheet arising from the spine of the seventh cervical and the upper two or three dorsal vertebræ and, proceeding downwards and outwards, is inserted by slips to the outer borders of the second to the fifth ribs. The *serratus posticus inferior* is likewise a thin muscular sheet, and arises from a membranous sheet attached to the last two dorsal and first two lumbar vertebræ, passing outwards to be inserted on the lower borders of the last four ribs. The *splenius colli* comes from the strong ligament attached from the spines of the cervical vertebræ to the skull, the ligamentum nuchæ, and from the last cervical and upper six dorsal vertebral spines, and passing upwards is inserted on the upper three cervical vertebræ. The *splenius capitis* has the same origin as the *splenius colli*, but, passing farther upwards and outwards, is inserted on the mastoid process of the temporal bone and the superior curved line of the occipital bone.

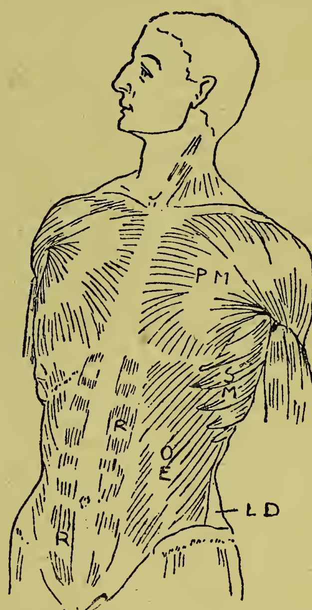
The *erector spinæ* muscle may be included in a separate group with the *complexus*, which has already been described with the other muscles of the back of the neck. The *erector spinæ* is composed of a series of muscular slips extending from the sacrum, to and from the vertebral column and ribs as far as the skull. It arises from the posterior part of the crest of the ilium, from the back of the sacrum, the posterior ilio-sacral ligaments, and from the spines of the sacral, lumbar, and lower two dorsal vertebræ. It divides into an outer part, the *ilio-costalis*, and an inner part, the *longissimus dorsi*. The *ilio-costalis* is inserted by muscular slips on the six lowest ribs, and beside each insertion another muscular slip arises to compose the *accessorius* muscle, which is inserted by muscular slips on the six uppermost ribs. In the same way at each of the insertions of the *accessorius* a muscular slip arises, and they combine to form a narrow muscular band, the *cervicalis ascendens* muscle, which is inserted on the fourth, fifth, and sixth cervical vertebræ. The inner part of the *erector spinæ*, the *longissimus dorsi*, is inserted by two sets of muscular slips, internally on the thoracic and the upper lumbar vertebræ and externally on all the ribs. Beside the insertions of the *longissimus dorsi* on the five or six uppermost ribs there arise muscular slips which go to form the *transversalis cervicis* muscle; this muscle, extending upwards, is inserted on all the cervical vertebræ except the first and last. The *trachelo-mastoid*, which is practically the prolongation of the *longissimus dorsi*, as far as the skull, arises from the six uppermost thoracic vertebræ, and is inserted on the mastoid process of the temporal bone of the skull. There is a part of the erector spinæ which is internal to the longissimus dorsi and cannot properly be included with that muscle; it is termed the *spinalis dorsi*, arises from the two lowest thoracic and two uppermost lumbar vertebræ, and, lying close to the spines of the thoracic vertebræ, is inserted on about six or seven of the upper thoracic vertebral spines.

A third group includes the *semispinales* and the *multifidus spinæ*. The *semispinales* muscle extends from the lumbar region to the upper end of the vertebral column, and is considered in two parts, the *semispinalis dorsi*, which arises from the six lowest thoracic vertebræ and is inserted on the last two cervical and first four thoracic vertebræ, and the *semispinalis colli*, which arises from the uppermost six thoracic and lowest four cervical vertebræ, and is inserted on the second to the fifth cervical vertebræ. The *multifidus spinæ* muscle arises from the sacrum, and by slips from the lumbar vertebræ, the thoracic vertebræ, and four lowest cervical vertebræ, and is inserted by slips to the spines of all the vertebræ.

The last group of the muscles of the back includes the *inferior* and *superior oblique*, and the *rectus capitis posticus major* and *minor*, which are situated at the back of the neck close below the skull, and have already been described with the muscles of the neck; it also includes the *rotatores dorsi*, which are eleven pairs of small muscular slips, each of which arises from the transverse process of a thoracic vertebra and is inserted on the lamina of the vertebra immediately above; the *interspinales*, which are muscular slips extending between the spinous processes of the vertebræ; and the *inter-transversales*, which are muscular slips extending between the transverse processes of the vertebræ.

The muscles of the back, along with other groups of muscles, act upon the head, vertebral column, ribs, and pelvis; they assist in producing the movements of flexion and extension of the head at the occipito-atlantoid joint, and of lateral movement at rotation at the atlanto-axial joint, of flexion, extension, and lateral movement of the vertebral column, and of flexion, extension, and lateral movement of the pelvis, the most important employment of the latter being in walking.

The **muscles of the thorax** comprise in addition to the muscles of the back which have been already described, *e.g. trapezius* and *latissimus dorsi*, the muscles of the chest wall and the muscles of respiration. In the first group is included the *pectoralis major*, which is a large fan-shaped muscle arising from the inner half of the clavicle, from the whole length of the sternum, from the first six costal cartilages, and by a small slip from the membranous aponeurosis of the external oblique muscle of the abdominal wall; from all these directions the muscular fibres converge towards the axilla or armpit, and are inserted for about three inches along the outer border of the bicipital groove of the humerus. The *pectoralis minor* is a narrow muscular band, arising from the anterior ends of the second (sometimes, third, fourth, and fifth) rib, and, proceeding upwards and outwards, is inserted on the front of the coracoid process of the scapula. The subclavius muscle is a small muscle arising from the inner end of the first rib and from the first costal cartilage, and inserted



Muscles of Thorax and Abdomen.—*PM*, pectoralis major; *SM*, serratus magnus; *R*, rectus abdominis; *OE*, external oblique; *LD*, latissimus dorsi.

along a groove in the middle of the under surface of the clavicle. The *serratus magnus* is a large muscle forming a great part of the side wall of the chest, which arises by eight muscular slips from the first eight ribs, and is inserted along the entire length of the under surface of the vertebral border of the scapula. The muscles in the above group act with the superficial muscles of the back in carrying out the movements, upwards or downwards, forwards or backwards, of the bony girdle of the shoulder, in raising the ribs and expanding the chest in deep and forced respiration, and in assisting the movements of the arm.

The **muscles of respiration** comprise the *external* and *internal intercostal* muscles, with three sets of less important small muscles, the *levatores costarum*, the *infra-costales*, and the *triangularis sterni*, and, most important, the *diaphragm*. Each of the *external intercostal* muscles arises from the lower border of a rib, and, going downwards and forwards, is inserted in the outer edge of the upper border of the rib immediately below extending in the space between the ribs from the transverse process of the vertebræ behind almost to the costal cartilages in front. Each of the *internal intercostal* muscles arises from the costal cartilage and from the inner part of the groove on the under surface of a rib, and, going downwards and backwards, is inserted on the inner edge of the upper border of the costal cartilage and the rib below, extending from the border of the sternum in front to the angle of the rib behind. The *levatores costarum* arise from the transverse processes of the last cervical and all but the last dorsal vertebræ and, proceeding downwards and outwards, are inserted on the outer aspect of the corresponding ribs, behind the angles. The *infra-costales* are muscular slips situated on the inner aspect of the lower ribs behind their angles, each of them arising from the inner edge of the under surface of a rib, and, passing over one or two ribs, is inserted on the upper border of a rib below. The *triangularis sterni* arises from the back of the ensiform cartilage and the sternum, and, spreading outwards, upwards and on each side, is inserted on the costal cartilages of the second, third, fourth, fifth, and sixth ribs. The *diaphragm* is the dome-shaped muscular partition which divides the cavity of the thorax from the cavity of the abdomen and it arises, in front, from the back of the ensiform cartilage, at the sides, by muscular slips from the cartilages of the lower six ribs, behind, by the right and left crura, fibro-muscular slips arising from the front of the lumbar vertebræ, and crossing one another in front of the aorta and also by the arcuate ligaments, the middle joining the crura in front of the aorta, the internal extending across the *psoas* muscle, and the external bridging across the *quadratus lumborum.* From all the above origins muscular fibres converge towards the centre of the body and are inserted in a large central tendon of trefoil shape. There are three openings in the diaphragm, the first, as has been noted, between the crura and behind the middle arcuate ligament, the aorta, vena azygos major and thoracic duct passing through it, the second in the right part of the central tendon, the inferior vena cava passing through it, and the third practically in the middle line, behind the central tendon, the œsophagus and both vagus nerves passing through it.

In breathing the movement of inspiration is carried out by the diaphragm becoming flatter, the central tendon being pulled downwards and so increasing the capacity of the thoracic cavity, while at the same time it raises the ribs, thus increasing the transverse diameter of the thorax; the *intercostals,* the *scaleni* muscles, the *serrati postici* muscles, and the *levatores costarum,* also assist in raising the ribs, while in a deep, forced inspiration the superficial and deep muscles of the back, the muscles of the chest, and the group of muscles between the root of the neck and the hyoid bone, are brought into play in increasing the capacity of the thorax.

Muscles of the Abdomen.—There are three sets of muscles which form respectively the lateral, anterior, and posterior abdominal walls between the ribs and the pelvis. The lateral walls of the abdomen are composed of three muscular layers, the *external oblique,* the *internal oblique;* and the *transversalis.* The *external oblique* muscle is a thin, broad, muscular sheet which arises by slips from the lower eight ribs, and, passing downwards and forwards, the lower part is inserted on the outer edge of the anterior half of the crest of the ilium, while the upper part ends in a membranous aponeurosis stretching across the front of the abdomen. This aponeurosis is attached above to the ensiform cartilage, below to the symphysis pubis, and between these points to the linea alba, a fibrous band extending vertically across the middle of the abdominal wall. The lower edge of the aponeurosis, stretching between the anterior superior spine of the ilium to the spine of the pubis, is turned back upon itself and forms Poupart's ligament. Immediately above Poupart's ligament and external to its attachment to the pubic spine there is a triangular opening in the aponeurosis through which passes the spermatic cord, containing the vas deferens or duct of the testis and other structures. The *internal oblique* muscle is a thin, broad, muscular sheet arising from the outer half of Poupart's ligament, from the anterior half of the crest of the ilium, and from the lumbar fascia, and, proceeding upwards and forwards, is inserted by slips on the three last ribs and also ends in an aponeurosis stretching across the front of the abdomen and forming an arch above Poupart's ligament for the transmission of the spermatic cord. The *transversalis* muscle is likewise a thin, broad, muscular sheet, which arises by slips from the under surface of the lower six rib cartilages, from the lumbar fascia, from the inner edge of the anterior half of the crest of the ilium, and from the outer half of Poupart's ligament, and proceeding forwards horizontally, ends in an aponeurosis which is inserted on the ensiform cartilage, the linea alba, and the crest of the pubis. The *rectus abdominis* muscle is the chief component of the anterior abdominal wall and is a broad muscular band which arises from the crest of the pubis, and becoming wider as it proceeds upwards, is inserted on the front of the ensiform cartilage and of the seventh, sixth, and fifth rib cartilages. It is enclosed in a membranous sheath, composed of the aponeuroses of the muscles of the side walls of the abdomen which have just been described; the aponeurosis of the *internal oblique* muscle splits, one layer joining the aponeurosis of the *external oblique* to form the anterior part of the sheath, and the other layer joining the aponeurosis of the *transversalis* to form the posterior part of the sheath. The anterior and posterior parts of the sheath meet again, after enveloping the muscle, in the middle line of the body, where they join the sheath of the opposite side and form the linea alba. This arrangement of the sheath does not, however, hold good at the upper and lower extremities of the muscle; at the upper end the muscle has only an anterior aponeurotic covering which comes from the external oblique aponeurosis, while at the lower end the aponeurosis of the external oblique, internal oblique, and transversalis join together to form an anterior covering only, the muscle resting on fascia behind, and the posterior part of the sheath ending at the level of the crest of the ilium in a crescent-shaped border termed the fold of Douglas. The *pyramidalis abdominis* muscle is a slight triangular muscular slip which arises from the pubic spine in front of the rectus, and, proceeding a short distance upwards, is inserted into the linea alba. The *cremaster* muscle is a thin, slight, muscular sheet, which arises from the lower border of the *internal oblique* and its fibres, arranged in loops, it forms a sheath round the spermatic cord and the testicle, the fibres being inserted in the fascia ; in the female very few muscular fibres are present, being replaced by the fascia which surrounds the round ligament of the uterus in the corresponding region. The muscles of the posterior wall of the abdomen comprise the *psoas, iliacus,* and *quadratus lumborum.* The *psoas* muscle is large and pear-shaped, with a wide origin, from the intervertebral discs of cartilage, from the margins of the vertebræ bordering them, and from the transverse processes of these vertebræ, extending from the last thoracic to the last lumbar vertebræ; the muscle, directed downwards and outwards, passing over the brim of the pelvis and beneath Poupart's ligament, is inserted on the small trochanter of the femur. The *quadratus lumborum* is a broad rectangular muscle which arises from the posterior third of the crest of the ilium, the ligaments between the vertebral column and the ilium, and the transverse processes of the two or three lower lumbar vertebræ, and, proceeding upwards, is inserted on the lower margin of the last rib and on the transverse processes of the two or three upper lumbar vertebræ. The *iliacus* is a fleshy fan-shaped muscle, which arises from a horseshoe-shaped origin in the hollow of the ilium and also from the ligaments joining the sacrum to the ilium and the vertebral column ; joining the psoas muscle and proceeding downwards with it over the side of the pelvis and over the hip joint, it is inserted on the small trochanter and for about one inch below it, while some fibres are inserted in the capsule of the hip joint. The *pyriformis* muscle is pear-shaped and connects the pelvis with the lower limb ; it arises within the pelvis from the three middle pieces of the sacrum, and, passing outwards and downwards from the pelvis through the great sacro-sciatic opening, receiving as it does so a muscular slip from the sciatic notch of the hip bone, is inserted on the upper edge of the great trochanter of the femur. The *obturator internus* muscle is fan-shaped and arises from the internal surface of the obturator membrane which stretches over the thyroid opening of the pelvis from the margin all round the opening and from the inner surface of the hip bone above and behind the thyroid opening, and, proceeding downwards, it hooks round the margin of the sacro-sciatic opening to be inserted below the middle of the upper margin of the great trochanter of the femur.

The bony pelvis is practically covered internally by muscles, the *pyriformis* at each side behind, the *obturator internus* at each side, and the *compressor urethræ,* which takes origin from the arch of the pubis, in front. The fascia of the pelvis covers the muscles, taking origin above from the promontory of the sacrum, the brim of the pelvis and the upper margin of the arch of the pubis, while below it is attached to the coccyx, the great sacro-sciatic ligament, the spine of the ischium on each side and the lower border of the pubic arch. From about the middle of the back of the pubis to the spine of the ischium there extends a thickened band of the fascia, termed the white line, along which the *levator ani* muscle takes origin, while above the origin of the muscle a secondary sheet of fascia, termed the visceral pelvic fascia, also takes origin from the white line, and, proceeding downwards and inwards, envelops, in the male, part of the rectum, the neck of the bladder, the prostate gland, and the seminal vesicles ; in the female part of the rectum, the neck of the bladder, the neck of the uterus, and part of the vagina are invested by the fascia.

The *levator ani* muscle arises, as has been noted, along the white line, and also from the back of the pubic arch and from the spine of the ischium, and, directed downwards and backwards, is inserted in the external sphincter (*i.e.* constricting muscle) of the anus, in a median fibrous band from the anus to the coccyx, and on the coccyx and the lowest part of the sacrum. The *ischio-coccygens* muscle is a slight muscular slip which arises from the spine of the ischium and from the small sacro-sciatic ligament, and, directed downwards and backwards, is inserted on the coccyx and the lowest part of the sacrum, having the visceral pelvic fascia between it and the rectum.

The region of the outlet of the pelvis, between the descending branches of the pubis and the ascending branches of the ischium, is termed the perineum.

The **muscles of the perineum** include the *transversus perinei superficialis* muscle, a band of muscular fibres arising from the ascending branch of the ischium and inserted in the mid-point of the perineum, meeting the muscle of the other side ; the *ischio-cavernosus* muscle, arising on each side from the spine of the ischium and enveloping the root of the corpus cavernosum of the penis, the corpus spongiosum and the bulb, being inserted in the membrane covering the corpus spongiosum and in the triangular ligament below the arch of the pubis ; the *compressor urethræ* muscle arises from the lowest part of the arch of the pubis, and, proceeding downwards and inwards, encloses the membranous part of the urethra, behind which it is inserted ; the *transversus perinei profundus* muscle arises from the ascending branch of the ischium, and is directed in the same direction as the compressor urethræ below and behind it, being inserted just behind that muscle ; the *external sphincter* muscle of the anus surrounds the opening of the anus and is oval in shape, attached behind to the coccyx and in front to the mid-point of the perineum, the deep part of the muscle being continuous with the levator ani and enveloping the anal canal. In the female the arrangement of these muscles differs somewhat, the muscles connected with the penis in the male being much smaller and connected with the clitoris in the female ; those connected with the urethra in the male are also smaller in the female and their relations are modified by the relation of the urethra to the vagina and to other parts ; the *bulbo-cavernosus* muscle in the female is separated by the opening of the vagina and urethra, and lies at each side of the opening.

The action of the *transversus perinei* is to pull back the central part of the perineum, of the *ischio-cavernosus* and *bulbo-cavernosus* to assist in the erection of the penis and clitoris, of the *compressor urethræ* to constrict the urethra and express the urine, being assisted also by the *bulbo-cavernosus*, while the *external sphincter* closes the anal canal.

Muscles of the Upper Limb.—The muscles of the upper limb properly include the superficial muscles of the back, which have already been described, the trapezius, latissimus dorsi, levator anguli scapulæ, rhomboidens major and minor, all of which have a greater or less influence upon the movements of the upper limb, all of them being attached either to the scapula, the clavicle, or the humerus; the muscles of the chest wall ought also to be included under this head, the pectoralis major and minor, subclavius, and serratus magnus, which have also been already described, and which, because of their attachments to the scapula, the clavicle, or the humerus, act upon the upper limb.

There is a group of **muscles in the region of the shoulder** which act, in conjunction with other muscles, upon the shoulder joint, comprising the *deltoid, teres major* and *minor, supraspinatus, infraspinatus*, and *subscapularis* muscles. The *deltoid* is a fleshy fan-shaped muscle which arises from the outer half of the clavicle, the outer edge of the acromion process of the scapula, all along the lower edge of the spine of the scapula, and, covering over the shoulder joint, its fibres converge to its insertion on a rough eminence on the humerus above the musculo-spinal groove. The *teres major* muscle is a fleshy muscular band which arises from the back of the scapula, at its axillary border near the apex, and, directed outwards and slightly upwards, is inserted for about two inches along the inner margin of the bicipital groove. The *teres minor* muscle is considerably smaller than the preceding, and, arising from the back of the scapula along the upper two-thirds of its axillary border, is directed upwards and outwards to be inserted on the lowest part of the great tuberosity of the humerus and for about one inch below it. The *supraspinatus* muscle, arising from the inner two-thirds of the hollow above the spine of the scapula, proceeds under the acromion process and is inserted on the top of the great tuberosity of the humerus. The *infraspinatus* muscle is of triangular shape, arises from a wide origin on the whole of the back of the scapula below the spine, except at the neck and along the axillary border of the bone, and, converging outwards with the *teres minor*, is inserted on the middle of the great tuberosity of the humerus. The *subscapularis* muscle is large and of triangular shape, arising from the whole of the under surface of the scapula except at the neck and along the edge of the vertebral border, and, directed upwards and outwards towards the head of the humerus, is inserted on the smaller tuberosity of the humerus and for about an inch below it; this muscle forms the posterior wall of the armpit. The above group of muscles acts mainly in assisting the movements of the shoulder joint, abduction and adduction, flexion and extension, rotation inwards and outwards, of the arm, and also aid in other movements of the arm and of the body.

The **muscles of the upper arm** are four in number. The *coraco-brachialis* muscle is a slight muscular slip which arises from the tip of the coracoid process of the scapula along with the short head of the biceps and is inserted at the middle of the inner side of the shaft of the humerus. The *biceps* is a large fleshy muscle which has two origins, the long head arising from above the glenoid fossa of the scapula, its tendon passing through the cavity of the joint and along the bicipital groove of the humerus, and the short head arising from the tip of the coracoid process of the scapula; the muscle has also two insertions, being inserted by a tendon on a rough oval tuberosity on the radius termed the *bicipital* tubercle, while from the inner part of the muscle a strong membranous slip (the *semilunar fascia*) extends over the bend of the elbow to join the deep fascia of the forearm. The *brachialis anticus* muscle is large and arises from rather more than the lower half of the front of the humerus, being inserted on the lower surface of the coronoid process of the ulna. The *triceps* is a large muscle which forms the back of the upper arm, and which arises by three heads, the long head taking origin from immediately below the glenoid fossa of the scapula, the outer head from the outer side of the humerus between the surgical neck and the musculo-spiral groove, and the inner head from a narrow triangular area extending from the top of the musculo-spiral groove for three-quarters of the length of the humerus on the inner side of the back of the bone; the muscle is inserted by a broad tendon on the top of the olecranon process of the ulna.

The **muscles of the forearm** are divided into four groups, the superficial muscles and the deep muscles of the front of the forearm, and the superficial muscles and the deep muscles of the back of the forearm. The superficial muscles of the front of the forearm comprise the *pronator radii teres, flexor carpi radialis, palmaris longus, flexor sublimis digitorum*, and *flexor carpi ulnaris*, all of which take at least part of their origin from the internal condyle of the humerus. The *pronator radii teres* is a short fleshy muscle which arises from above the internal condyle, and from the inner side of the coronoid process of the ulna, and, directed downwards and outwards across the ulna and radius, is inserted about the middle of the outer side of the shaft of the radius. The *flexor carpi radialis* muscle arises from the internal condyle and has a fleshy belly ending half-way down the forearm in a rounded tendon which passes below the anterior annular ligament in a compartment of its own, and is inserted on the front of the base of the metacarpal bone of the middle finger. The *palmaris longus* muscle arises from the common origin on the internal condyle of the humerus and has a short muscular belly ending about the middle of the forearm in a long flattened tendon which passes over the anterior annular ligament of the wrist to be inserted in the thick fascia of the palm of the hand; and the tendon of the *palmaris longus* is seen at the wrist when the thumb is adducted (*i.e.* made to touch the little finger) and, with the muscle, is frequently absent. The *flexor sublimis digitorum* is situated more deeply than the other muscles of this group, and it arises from the internal condyle of the humerus, by a slip from the inner border of the coronoid process of the ulna, and from a narrow oblique line across the upper half of the front of the radius below the bicipital tubercle; in the lower part of the forearm the muscle divides into four bellies, each of which ends in a tendon which goes beneath the anterior annular ligament, crosses the palm, and is inserted on the front of the shaft of the second phalanx of one of the fingers; the corresponding tendon of the *flexor profundus digitorum* passes through an opening in the tendon of the flexor sublimis digitorum just before its insertion. The *flexor carpi ulnaris* arises from the internal condyle of the humerus and also from the inner margin of the olecranon process of the ulna; passing down along the inner side of the forearm it is inserted on the pisiform bone of the wrist.

The *deep muscles of the front of the forearm* comprise the *flexor profundus digitorum*, the *flexor longus pollicis*, and the *pronator quadratus* muscles. The *flexor profundus digitorum* is a large muscle which arises from the upper three-quarters of the front and inner side of the shaft of the ulna, except the coronoid process, and from the inner half of the interosseous membrane between the ulna and radius; it ends in a broad tendon which passes beneath the anterior annular ligament of the wrist, and then divides into four smaller tendons which, after passing through openings in the corresponding tendons of the *flexor sublimis digitorum*, are inserted on the terminal phalanges of the fingers. The *flexor longus pollicis* arises from the front of the radius, below the bicipital tubercle and opposite the origin of the flexor profundus digitorum on the ulna, and also from the outer half of the interosseous membrane; it ends in a tendon which passes beneath the anterior annular ligament in a compartment of its own and is inserted on the front of the base of the terminal phalanx of the thumb. The *pronator quadratus* is a square, flat muscle, arising from the lowest quarter of the front of the shaft of the radius, and, directed horizontally outwards, is inserted on the lowest quarter of the front of the shaft of the ulna.

The *superficial muscles of the back of the forearm* comprise the *supinator longus*, *extensor carpi radialis longior* and *brevior*, *extensor communis digitorum*, *extensor minimi digiti*, *extensor carpi ulnaris*, and *anconeus* muscles. The *supinator longus*, or *brachio-radialis*, arises from the lower third of the humerus, along the line of the external supra-condyloid ridge, and, proceeding downwards at the outer side of the forearm, ends about its middle in a narrow tendon which is inserted at the outer side of the lower end of the radius. The *extensor carpi radialis longior* arises from the lower part of the external supra-condyloid ridge, and, ending half-way down the forearm in a tendon which passes beneath the posterior annular ligament of the wrist, is inserted on the back of the base of the metacarpal bone of the index finger. The *extensor carpi radialis brevior* arises in common with the other extensor muscles from the external condyles of the humerus and from the external lateral ligament of the elbow-joint; proceeding downwards, it passes beneath the posterior annular ligament and is inserted on the back of the base of the third metacarpal bone, just beyond the root of its styloid process. The *extensor communis digitorum* arises from the external condyle and ends above the wrist in four tendons which proceed beneath the posterior annular ligament of the wrist and are inserted partly on the first, partly on the second, and partly on the base of the third phalanx of the four fingers. The *extensor minimi digiti* is a narrow muscular slip which arises from the external condyle along with the extensor communis digitorum and ends in a tendon which passes in a compartment of its own beneath the posterior annular ligament to be inserted in connection with the tendon of the extensor communis digitorum on the back of the first phalanx of the little finger. The *extensor carpi ulnaris* arises from the extensor condyle of the humerus and also from the middle part of the posterior border of the ulna; it ends about the lower part of the forearm in a tendon which passes beneath the posterior annual ligament in a special compartment and is inserted on the back of the base of the metacarpal bone of the little finger. The *anconeus* is a small muscle, triangular in shape, which arises from the back of the external condyle of the humerus and is inserted on a triangular area on the outer side of the olecranon process and the back of the ulna.

The *deep muscles of the back of the forearm* are the *extensor ossis metacarpi pollicis, extensor brevis pollicis, extensor longus pollicis, extensor indicis proprius*, and *supinator radii brevis* muscles. The *extensor ossis metacarpi pollicis* arises from the outer margin of the back of the ulna, rather above the middle and below the insertion of the anconeus, from the interosseous membrane, and from the middle of the inner side of the back of the radius; crossing over the radial extensors it is inserted at the outer side of the base of the metacarpal bone of the thumb. The *extensor brevis pollicis*, or *extensor primi internodii pollicis*, arises from the inner side of the back of the radius and from the outer half of the interosseous membrane, below the *extensor ossis metacarpi pollicis;* proceeding outwards with that muscle, to which it is closely attached, it passes under the posterior annular ligament of the wrist and is inserted on the back of the base of the proximal phalanx of the thumb. The *extensor longus pollicis*, or *extensor secundi internodii pollicis*, arises from the outer margin of the back of the ulna and from the inner half of the interosseous membrane, below the *extensor ossis metacarpi pollicis;* at first overlapping the *extensor brevis* somewhat, after passing beneath the posterior annular ligament it twists over the radial extensors to be inserted at the back of the base of the distal phalanx of the thumb. The *extensor indicis proprius* arises from a small area on the outer margin of the back of the ulna and on the inner half of the interosseous membrane, below the extensor longus pollicis; ending in a tendon which passes through a special compartment along with the extensor communis digitorum beneath the posterior annular ligament, it is inserted on the back of the first phalanx of the index finger. The *supinator radii brevis* arises from a triangular depression on the outer side of the ulna, below the lesser sigmoid cavity, and from the orbicular ligament; directed outwards and downwards, it sweeps round and envelops the upper part of the shaft of the radius, and is inserted on it from the neck almost to the middle of the shaft.

The **muscles of the hand** include the *palmaris brevis* muscle, the muscles of the thumb, the muscles of the little finger, the *lumbricales*, and the *interrossei* muscles. The *palmaris brevis* is a little, square, thin muscle in the palm of the hand immediately below the superficial fascia; it arises from the inner margin of the thick palmar fascia and is inserted in the skin of the inner border of the hand. The muscles of the thumb are five in number. The *abductor pollicis* arises partly from the scaphoid bone and partly from the trapezium, and, crossing over the other muscles of the thumb, it is inserted at the outer side of the base of the proximal phalanx of the thumb. The *flexor brevis pollicis* has two parts; the superficial part arises from the lower border of the anterior annular ligament and is inserted on the outer side of the base of the proximal phalanx of the thumb; the deep part arises from the inner side of the base of the metacarpal bone, and is inserted on the inner side of the base of the proximal phalanx of the thumb. The *opponeus pollicis* arises from the lower part of the anterior annular ligament and from the trapezium, and is inserted along the whole of the outer half of the front of the metacarpal bone of the thumb. The *adductor obliquus pollicis* arises from the front of the base of the second and third metacarpals and from the front of the os magnum, trapezoid, and trapezium; it is inserted on the inner side of the base of the proximal phalanx of the thumb, a sesamoid bone being developed in the tendon of the muscle. The *adductor transversus pollicis* is triangular in shape, and arises from the ridge along the middle of the metacarpal bone of the middle finger; passing directly outwards it is inserted on the inner side of the base of the proximal phalanx of the thumb.

The *muscles of the little finger* are three in number. The *abductor minimi digiti* arises from the pisiform bone and is inserted at the inner side of the base of the proximal phalanx of the little finger. The *flexor brevis minimi digiti* arises from the hook of the unciform and from the front of the anterior annular ligament; it is inserted on the ulnar side of the proximal phalanx of the little finger. The *opponens minimi digiti* arises from the hook of the unciform, below the origin of the flexor brevis, and from the front and lower border of the anterior annular ligament; it is inserted along the ulnar side of the metacarpal bone of the little finger. The *lumbricales* are four in number, and are little rounded muscles in the palm of the hand connected with the tendons of the flexor profundus digitorum; the two outer lumbricales arise by single heads from the radial side of the tendon to the index finger and to the middle finger respectively; the two inner lumbricales arise by double heads from the tendons of the second and third, and from the third and fourth fingers respectively. Each of the lumbricales is inserted on the outer side of the expansion of the extensor tendon on the back of the phalanges of the fingers, near the base of the first phalanx.

The *interossei muscles* number three on the *palmar* side and four on the *dorsal* side of the hand. Of the former, the first arises from the ulnar side of the metacarpal bone of the first finger and is inserted on the same side of the first phalanx; the second and third arise from the radial sides of the metacarpal bone of the third and fourth fingers respectively and are inserted on the same sides of the first phalanges. One of the dorsal interosseous muscles is situated in each of the interosseous spaces, the first arising from the adjacent sides of the metacarpal bones of the thumb and first finger, and inserted at the radial side of the first phalanx of the index finger; the second arising from the adjacent sides of the metacarpal bones of the first and three middle fingers, and inserted at the radial side of the first phalanx of the middle finger; the third arising from the adjacent sides of the metacarpal bones of the middle and third fingers and inserted at the ulnar side of the first phalanx of the middle finger; and the fourth arising from the adjacent sides of the metacarpal bones of the third and fourth fingers and inserted at the ulnar side of the third finger.

Muscles of the Lower Limb.—The muscles of the lower limb include certain muscles which have already been described with the muscles of the posterior abdominal wall, the *psoas*, the *iliacus*, the *pyriformis*, and the *obturator internus* muscles.

There is a group of muscles which form the fleshy part of the thigh, acting upon the hip-joint, and certain of them also on the knee-joint: these comprise, on the front of the thigh, the *quadriceps extensor* (composed of four muscles which join towards their insertion, the *rectus femoris, vastus externus* and *internus*, and *crureus*), *sartorius*, and *pectineus*; on the inner side of the thigh, *adductor brevis, adductor longus, adductor magnus*, the *gracilis*, and the *obturator externus*; in the region of the buttock, the *gluteus maximus, medius*, and *minimus*, the *gemelli* muscles, and the *quadratus femoris*; at the back of the thigh, extending down to the knee, are the *hamstring* muscles, the *biceps, semitendinosus*, and *semimembranosus*.

The above groups of muscles act upon the pelvis, and upon the hip-joint and the knee-joint. The movements of the thigh at the hip-joint are flexion and extension, adduction and abduction, internal and external rotation, while at the knee-joint the chief movements are flexion and extension, the former being much the more powerful.

The *rectus femoris* is a broad muscular band narrowing towards the knee, arising by two heads from the pelvis (one from the anterior inferior iliac spine, and one from just above the socket of the hip-joint), and is inserted by a strong tendon on the upper border of the patella. The *vastus externus* is a thick muscle on the outer side of the thigh, arising from the upper part of the shaft of the femur and partly joining the tendon of the rectus femoris is inserted on the outer side of the patella. The *vastus internus* is on the inner side of the thigh, larger than the external muscle, arising from a longer origin on the upper part of the shaft of the femur and, also, partly joining the tendon of the rectus femoris, is inserted on the inner side of the patella. The *crureus* is hidden by the other three muscles of the quadratus femoris; it arises from a large surface on the upper part of the shaft of the femur and joins the tendons of the rectus and vasti. The *sartorius* is a strap-like muscle arising from the anterior superior iliac spine of the pelvis and, crossing from the outer side of the thigh to the inner side of the knee, is inserted on the inner side of the shaft of the tibia below the tuberosity. The *pectineus* muscle is a band arising from the ilio-pectineal line on the pubis and, proceeding outwards and downwards, is inserted on the upper part of the shaft of the femur.

The *adductor brevis* is a triangular muscle arising from the pubis, and, proceeding downwards and outwards beneath the pectineus and adductor longus, is inserted along the upper part of the ridge on the back of the shaft of the femur. The *adductor longus* is narrower but longer than the brevis, and arises from the pubis near the symphysis, going downwards and outwards to be inserted along the middle of the ridge on the back of the shaft of the femur. The *adductor magnus*, largest of the three, is a triangular muscle arising from the edge of the ischium and the arch of the pubis, and is inserted all along the ridge and right down to the internal condyle of the lower end of the femur. The *gracilis* is a flat muscular band extending along the inner side of the thigh, arising from the lower part of the symphysis pubis, and inserted on the inner side of the head of the tibia. The *obturator externus* arises from the lower edge of the large thyroid foramen of the pelvis on its outer side, and, going outwards horizontally, is inserted on a hollow on the great trochanter of the femur.

The *gluteus maximus* is a large fleshy muscle arising from the back of the sacrum and the coccyx and from the posterior part of the back of the ileum; it is inserted on a prominent ridge at the neck of the femur and also into the fascia of the thigh. The *gluteus medius* is a fan-shaped muscle arising from the middle of the back of the ileum and inserted on the outer side of the great trochanter of the femur. The *gluteus minimus* arises from the anterior part of the back of the ileum, and it is also inserted on the outer side of the great trochanter, and in addition, into the capsule of the hip-joint. The two *gemelli* muscles are accessory parts of the obturator internus arising from the back of the ischial spine and the edge of the lesser sciatic notch, and inserted along with the obturator internus on the inner side of the great trochanter. The *quadratus femoris* is situated beneath the gluteus maximus; it arises from the outer edge of the tuberosity of the ischium and goes horizontally across to be inserted along a line on the back of the neck of the femur.

Of the hamstring muscles, the *biceps* arises from a double origin, the *long head* from the lower part of the ischial tuberosity, concealed by the gluteus maximus, proceeding downwards is joined by the *short head* from the ridge on the back of the shaft of the femur; the biceps passes to the outer side of the knee and is inserted into the head of the fibula. The *semitendinosus* muscle arises along with the long head of the biceps from the ischial tuberosity, and, passing to the inner side of the knee, is inserted on the inner side of the tibia immediately below the internal tuberosity of its head. The *semimembranosus* muscle arises from the outer side of the ischial tuberosity, and, passing to the inner side of the knee, is inserted on the back of the internal tuberosity of the head of the tibia.

The *muscles of the leg and foot* are divided into three sets: the muscles on the front of the leg and front (or dorsum) of the foot, the *peronei* muscles on the outer side of the leg, and the muscles on the back of the leg and in the sole of the foot.

The muscles of the leg and foot act upon the ankle-joint, the metatarso-phalangeal joints, and the inter-phalangeal joints of the toes; while certain of them, situated on the back of the leg, also take part in the movements of the knee-joint. At the ankle-joint the movements are flexion and extension of the foot on the leg, and inversion and eversion of the extended foot; at the metatarso-phalangeal joints the movements are flexion and extension, adduction and abduction; and at the inter-phalangeal joints the movements are flexion and extension.

The first group of muscles includes the *tibialis anticus*, the *extensor longus digitorum*, the *extensor proprius hallucis*, and the *peroneus tertius* on the front of the leg, and the little *extensor brevis digitorum* on the dorsum of the foot.

The *tibialis anticus* arises from the upper two-thirds of the outer side of the shaft of the tibia and from the membrane between the tibia and the fibula, and passing downwards over the dorsum of the foot, its tendon is inserted on the internal cuneiform bone and the base of the first metatarsal. The *extensor longus digitorum* arises from the outer side of the external tuberosity of the head of the tibia and from the upper two-thirds of the front of the shaft of the fibula, and its tendon eventually divides into four small tendons which are inserted on the four outer toes in the same manner as the corresponding tendons on the fingers. The *extensor proprius hallucis* arises from the middle two-thirds of the front of the shaft of the fibula and from the interosseous membrane; passing over the front of the foot, its tendon is inserted on the base of the end phalanx of the great toe. The *peroneus tertius* is really part of the extensor longus digitorum; it arises with that muscle from the front of the fibula, and its tendon is inserted on the front of the base of the fifth metatarsal. The *extensor brevis digitorum* is a little muscle composed of four fleshy slips arising together from an impression on the upper surface of the os calcis, and its four tendons are inserted on the four inner toes with the tendons of the extensor longus digitorum.

The two *peronei* muscles—*longus* and *brevis*—are placed on the outer side of the leg. The *peroneus longus* arises from the upper two-thirds of the outer aspect of the shaft of the fibula, and its tendon hooks round the external malleolus, proceeds across the outer side of the os calcis, then beneath the cuboid bone in a groove, to be inserted eventually on the internal cuneiform bone and the base of the first metatarsal. The *peroneus brevis* arises from the lower two-thirds of the outer aspect of the fibula, and its tendon passes behind the external malleolus and over the outer side of the os calcis, to be inserted in the base of the fifth metatarsal.

The *muscles on the back of the leg* include the *gastrocnemius*, *plantaris*, and *soleus* superficially, and the *popliteus*, *flexor longus digitorum*, *tibialis posticus*, and *flexor longus hallucis*, placed more deeply.

The *gastrocnemius* arises by an inner head from the internal condyle of the femur and by an outer head from the external condyle of the femur; these heads join to form a fleshy belly which gradually narrows to end in a strong tendon, the *tendo Achillis*, which is inserted on the lower part of the posterior aspect of the os calcis.

The *plantaris* is a small muscular slip arising from just above the external condyle of the femur and ending in a long tendon which proceeds right to the heel to be inserted on the back of the os calcis. The *soleus* arises from the head and the upper third of the shaft of the fibula, from the ridge on the back of the neck and a small part of the inner border of the tibia, and from a fibrous arch between the bones, below the gastrocnemius and plantaris; it is inserted into the tendo Achillis.

The *popliteus* arises from a ridge on the outer side of the external condyle of the femur, and, passing obliquely inwards across the back of the knee-joint, is inserted on the back of the neck of the tibia. The *flexor longus digitorum* arises from the middle part of the posterior aspect of the tibia, and its tendon, dividing into four smaller tendons, is inserted into the four outer toes in the same manner as the corresponding tendons in the fingers. The *tibialis posticus* arises from the middle two-thirds of the back of the fibula, from the middle third of the back of the tibia, and from the interosseous membrane between the bones; its tendon passes behind the internal malleolus beneath the foot to the inner border, whence tendinous bands are inserted on the scaphoid, middle, internal, and external cuneiform, second, third, and fourth metatarsals, cuboid and os calcis bones. The *flexor longus hallucis* arises from the lower two-thirds of the posterior aspect of the fibula, and its tendon, passing behind the lower end of the tibia and grooving the astragalus and the under surface of the os calcis, goes forwards beneath the foot to be inserted on the base of the end phalanx of the great toe.

The *muscles of the sole of the foot* may be arranged in four sets according to the layers in which they are situated beneath the plantar fascia. In the first layer are the *abductor hallucis*, arising from the tubercle of the os calcis and from the plantar fascia and inserted on the inner side of the first phalanx of the great toe; the *flexor brevis digitorum*, arising also from the tubercle of the os calcis and from the plantar fascia, being inserted on the second phalanges of the four outer toes; the *abductor minimi digiti*, arising from a larger part of the tubercle of the os calcis and from the plantar fascia, and inserted on the outer side of the first phalanx of the little toe.

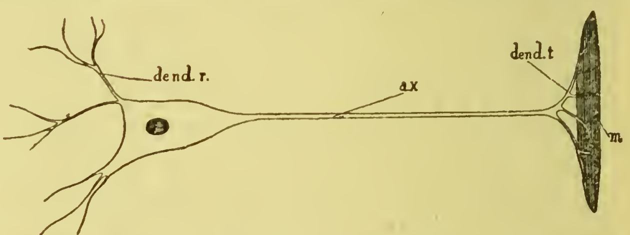
In the second layer lie the tendons of the flexor longus hallucis and flexor longus digitorum, already described, and with these tendons are associated the *lumbricales* and the *accessorius*. The *lumbricales* are four small muscular bellies, the first arising from the inner side only of the tendon of the flexor longus digitorum to the second toe, while the other three arise, each by two origins, from the adjacent sides of the four tendons. Each little muscle is inserted on the inner side of the base of the corresponding first phalanx. The *accessorius* muscle arises by an outer head from the outer side and by an inner head from the inner side of the under surface of the os calcis, and it is inserted on the upper surface of the tendon of the flexor longus digitorum.

The third layer is composed of the *flexor brevis hallucis*, arising from the inner side of the cuboid bone and from the tendon of the tibialis posticus, and, dividing into two parts, inserted at each side of the base of the first phalanx of the great toe; the *adductor obliquus hallucis*, arising from the heads of the third and fourth metatarsals, and, proceeding inwards and forwards, inserted on the outer side of the base of the first phalanx of the great toe; the *adductor transversus hallucis*, arising from the capsules of the four outer metatarso-phalangeal joints, and, proceeding transversely inwards, inserted with the adductor obliquus on the outer side of the base of the first phalanx of the great toe; and the *flexor brevis minimi digiti*, arising from the base of the fifth metatarsal and inserted on the outer side of the base of the first phalanx of the little toe along with the adductor minimi digiti.

The fourth layer consists of the plantar and the dorsal *interossei* muscles. Each of the three *plantar interossei* arises by a single head from the inner side of the shaft of the third, fourth, and fifth metatarsal respectively, and each is inserted on the same side of the first phalanx of the corresponding toe. The four *dorsal interossei* each arise by two heads from the adjacent sides of the shafts of the metatarsal bones; the *first* and *second* are inserted on the first phalanx of the second toe, on the inner and outer sides respectively; the *third* and *fourth* interossei are inserted on the outer sides of the first phalanges of the third and fourth toes respectively.

THE NERVOUS SYSTEM

The nervous system includes the central nervous system, comprising the brain and spinal cord; the peripheral nervous system, comprising the cranial nerves, the spinal nerves, and the sense organs (which are treated in a separate section), eye, ear,



Diagrammatic Figure of a Neuron or Nerve Cell in Connection with a Simple Muscle Cell.—*ax*, axon; *dend. r*, receptive dendrites; *dend. t*, terminal dendrite; *m*, muscle cells.

organ of smell, organ of taste, and organs of touch; and the sympathetic nervous system.

The tissue of the nervous system is composed of nerve cells, nerve fibres, and a specialised connective tissue termed neuroglia (i.e. *nerve-glue*). The *nerve cells* vary from practically the smallest to much the largest size of cells in the body, and they are irregular in shape and have numerous branches. One of these branches, termed the *axon* or *axis cylinder*, is a nerve fibre, while the others break up into finer branches and come into relation with similar branches of neighbouring nerve cells. The nerve cells are situated mainly in the brain and spinal cord, and their function consists in receiving, sending out, or in taking part in transmitting nervous impulses. The *nerve fibres* are the main processes, or axons, of the nerve cells, only one axon coming from each cell, and they may be either non-medullated (*i.e.* without any covering or with only a fine membranous sheath, the *neurilemma*), or *medullated* (*i.e.* enclosed in a sheath of fatty substance termed myelin, which is usually covered with neurilemma). At regular intervals of about $\frac{1}{25}$ of an inch the myelin is interrupted by constrictions, termed the *nodes of Ranvier*, which are characterised

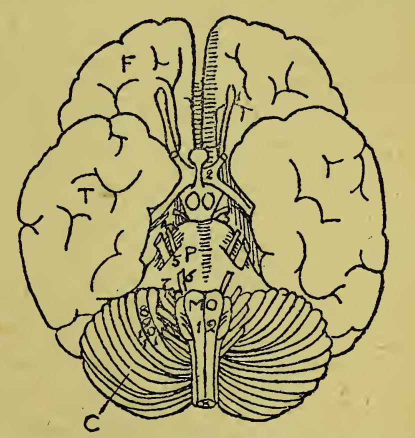
BRAIN—VERTICAL MEDIAN SECTION.—*Cr*, cerebrum; *Cb*, cerebellum; *CC*, corpus callosum; *F*, fornix; *VI*, velum interpositum; *CQ*, corpora quadrigemina; *MO*, medulla oblongata; *P*, pons; *PI*, pituary body.

by staining deeply with silver nitrate in microscopic preparations. An axon runs with interruption from a nerve cell to a sense organ. The *neuroglia* is of two types, that lining the ventricles of the brain and the central canal of the spinal cord consisting of columnar cells, while elsewhere it is formed of small branching cells, the processes of which, except in the grey matter of the brain, interlace with the processes of the nerve cells.

The **brain** is that part of the central nervous system contained within the skull, and it consists of the *cerebrum*, divided into two hemispheres, the great mass of the brain which dominates the working of the other parts of it; the *mid-brain*, a short stalk connecting the cerebrum with the *hind-brain*, which comprises the *pons Varolii*, bridging over the lower part of the stalk; the *cerebellum*, a large bi-lobular mass below and behind the cerebrum; and the *medulla oblongata*, the bulbous continuation of the spinal cord in the skull, below the cerebellum. The brain is enveloped by three membranes, the *dura mater*, the *arachmoid mater*, and the *pia mater*. The dura mater is the most external, closely applied to the interior of the cranial bones, and strong extensions of it dip down into the brain, the *falx cerebri*, a deep sickle-shaped partition, dividing the two hemispheres of the cerebrum, the *tentorium cerebelli* forming a floor between the cerebrum and the cerebellum, and the *falx cerebelli* separating the halves of the cerebellum behind. The dura mater also forms channels, *venous blood sinuses*, for conveying the venous blood away from the brain. The arachnoid mater is a delicate membrane loosely covering the brain, and separated from it by the pia mater, which closely covers the outer surface, dipping down into the furrows between the convolutions on the surface of the brain.

From above the brain is ovoid in shape, the broad end being towards the back, and the only part seen is the convex convoluted cerebrum, divided into two equal hemispheres by a deep cleft, the *great longitudinal fissure*. From below, the surface of the brain is more irregular, adapted to the floor of the cranium. In front, the cerebrum presents a flattened surface, divided up the middle by the continuation of the great longitudinal fissure, on each side of which, closely applied to the surface of the hemisphere, runs a slender band of nerve fibres, the *first cranial* or *olfactory* nerve, ending in a bulb, the *olfactory bulb*. In the middle a rounded lobe of the cerebrum projects downwards and forwards at each side, enclosing, with the prominent rounded pons Varolii, which is situated at the posterior part of the middle of the brain, a central space containing several structures of importance. At the back, the cerebrum is concealed by the cerebellum, which is recognised by its closely set, curved, parallel fissures, while, dividing the cerebellum into two equal hemispheres, the medulla oblongata, emerging from under the pons Varolii, projects downwards and backwards.

The hemispheres of the *cerebrum* are joined together at the foot of the great longitudinal fissure by a broad transverse band of fibres which radiate to the surface of each hemisphere, termed the *corpus callosum*. The substance of the cerebrum is composed of *grey matter*, consisting of groups of nerve cells which form centres for sensation, thought, &c., and *white matter*, consisting of nerve fibres held together by the neuroglia. A layer of grey matter covers over the surface, and this layer,



BRAIN-BASE.—*F*, frontal lobe; *T*, temporal lobe; *C*, cerebellum; *P*, pons Varolii; *MO*, medulla oblongata; cranial nerves 1–12.

under the miscroscope, is found to be made up of four layers of different types of branching nerve cells, from which numerous fine nerve fibres are given off. The surface of the cerebrum is thrown into folds, termed *convolutions* or *gyri* with furrows termed *sulci* or, in the case of the deeper ones, *fissures*, between. Because of these convolutions and sulci the surface area, and therefore the grey matter, of the brain is greatly increased. The depth of the furrows and the prominence of the convolutions is in direct proportion to the intelligence; in the brains of intellectual persons they are very well marked, in persons of low intelligence and still more in idiots they are but slightly marked, while in the lower animals they become less and less marked, and eventually disappear as the scale is descended. The furrows and convolutions have practically the same position in different brains; the two most important furrows are the *fissure of Sylvius*, which begins at the front of the inner margin of the lower surface of the hemisphere and extends outwards and upwards to about the centre of its external surface, and the *fissure of Rolando*, which extends obliquely downwards and forwards on the external surface from the middle of the superior margin of the hemisphere almost to the fissure of Sylvius. The hemispheres are divided into lobes by the fissures; the *frontal* lobe is the front part of the cerebral hemisphere, bounded behind by the fissure of Rolando and below by the fissure of Sylvius; the *parietal* lobe is the upper part and the side of the hemisphere, bounded in front by the fissure of Rolando and below by the fissure of Sylvius and an imaginary line drawn backwards in continuation of it; the *occipital* lobe is the back pyramidal part of the hemisphere, divided from the adjacent lobes by arbitrary boundaries, except on its inner aspect, where a deep fissure divides it off; the *temporal* lobe is the lower part of the front and side of the hemisphere, below the Sylvian fissure and an imaginary line drawn backwards from it. The *falciform* or *limbic* lobe is that part of the hemisphere on its inner surface, towards the longitudinal fissure, above, behind, and below the corpus callosum; while the *island of Reil*, or *central* lobe, is situated at the bottom of the fissure of Sylvius, and can only be observed when the lips of the fissure are pulled widely asunder. If the corpus callosum, which joins the two cerebral hemispheres, be cut through so as to separate the hemispheres completely, the *ventricles* or internal cavities of the brain, normally containing a clear fluid, can be observed. The *lateral ventricles*, one in the middle of each cerebral hemisphere, are cavities with an anterior, a posterior, and a descending horn, and each communicates by a small opening, the *foramen of Monro*, with the third ventricle; the *third ventricle* is a narrow cleft between the hemispheres, below the corpus callosum, and from it a channel, termed the *aqueduct of Sylvius*, leads backwards to the *fourth ventricle*, which is a shallow quadrilateral cavity, tapering to a point at its upper and lower extremities, above and behind the pons Varolii. The so-called *fifth ventricle* has no connection with the other ventricles, and is a little cleft in the partition between the lateral ventricles in front.

On each side of the third ventricle, composing that part of each hemisphere which forms its lateral wall, is an ovoid mass of grey matter termed the *optic thalamus*, its superior surface forming part of the floor of the lateral ventricle. Extending in an arch from the anterior horn to the descending horn of each lateral ventricle, and bulging into it, is another mass of grey matter, in the interior of each hemisphere, termed the *candate nucleus*. On the other side of the optic thalamus and the candate nucleus, embedded in the white substance of the cerebrum between them and the surface, is another mass of grey matter, the *lenticular nucleus*; that part of the cerebrum between the optic thalamus and the lenticular nucleus is an important structure, composed of the nerve fibres which go to and from the nerve cells of the cerebral cortex, and is termed the *internal capsule*.

On the under surface of the brain, bounded at the sides by the temporal lobes of the cerebral hemisphere projecting downwards and forwards, behind by the prominent pons Varolii, and in front by the posterior border of the frontal lobes, from which the olfactory tracts go forward, is a space containing certain structures. At the back of this space two thick bands, the *crura cerebri*, which contain nerve fibres to and from the cerebral cortex, issue from the pons Varolii, and, diverging outwards and forwards, pass into the cerebrum at each side. Immediately in front of the crura cerebri two slender, flattened bands, the *optic tracts*, emerge from the cerebral hemispheres and join one another in the front of the space, forming the *optic chiasma*, from which the two optic nerves proceed forwards and outwards. At each of the upper corners of the space, between the optic chiasma and the commencement of the olfactory tracts, is a depression, the *anterior perforated spot*, through the small apertures in which blood-vessels go to the substance of the brain. Behind the optic chiasma, in the centre of the space, is an eminence, the *tuber cinereum*, from the apex of which goes the stalk, or *infundibulum*, connecting the *pituitory gland*. This body, developed partly from the nervous and partly from the alimentary system, is situated in a hollow in the floor of the cranium, and its functions are obscure, but it has an influence upon the growth of the tissues. Behind the tuber cinereum, and between the crura cerebri, is a pair of small rounded projections, the corpora mammilaria, while between them and the front of the pons Varolii is a depression, the *posterior perforated spot*, through the small apertures in which blood-vessels pass to the brain substance.

The *mid-brain*, which connects the cerebrum with the hind-brain, consists, in its under part, of the thick bands of nerve fibres composing the crura cerebri, while its superior part consists of two pairs of rounded projections, the *superior quadrigeminal bodies* above and the *inferior quadrigeminal bodies* below. Projecting from the back of the third ventricle over the quadrigeminal bodies is the *pineal body*, shaped like the stone of a cherry, imagined by the ancient anatomists to be the seat of the soul, and now considered to be a rudimentary third eye. In the centre of the mid-brain, between the crura cerebri and the quadrigeminal bodies, runs the *aqueduct of Sylvius*, the canal connecting the third and fourth ventricles.

The *hind-brain*, as has been noted, consists of the pons Varolii, the cerebellum, and the medulla oblongata.

The *pons Varolii* forms a large rounded prominence on the under surface of the brain, bridging over that part between the medulla oblongata and the crura cerebri. It lies in front of the cerebellum, to which a broad band of fibres passes back from it at each side, and its posterior surface forms the floor of the fourth ventricle. It is mainly composed of nerve fibres linking up the different parts of the brain and going to and from the spinal cord, forming the white matter, and also of small masses of nerve cells, forming the grey matter, irregularly scattered through the white matter.

The *cerebellum* lies below and behind the cerebrum and behind the pons Varolii and medulla oblongata, and consists of a median portion, the *vermis*, at the sides of which lie two rounded lateral parts, the *lateral hemispheres*. Both in front and behind, the cerebellum has a marked notch in the middle, the hemispheres forming the sides of the notch and the vermis the bottom, and the posterior notch, which is the narrower, is occupied by a sickle-shaped fold of dura mater, the *falx cerebelli*. The surface is divided by curved parallel fissures, closely set together, into characteristic folds or *lamellæ*, and if a section is made through the body of the cerebellum it is observed that the arrangement of the branching fissures and lamellæ gives it a peculiar tree-like appearance, termed the *arbor vitæ*. Like the cerebrum the surface is covered with a layer of grey matter, which, examined microscopically, shows two layers of nerve cells, with a layer of large pear-shaped cells, peculiar to the cerebellum, at their junction; the interior of the cerebellum is composed of white matter. Some of the fissures which divide up the surface of the cerebellum are deeper and more evident than the others, and these divide the surface into recognised lobes; the most important is the *great horizontal fissure*, which begins at one side of the organ in front, its edges enclosing the cerebellar peduncles, and passes horizontally right round it, across the one hemisphere, to enclose the peduncles at the other side in front; this fissure is the division between the upper and lower surfaces of the cerebellum.

The cerebellum is attached to the other parts of the brain by three pairs of thick bands of fibres, the largest of which, the *middle peduncles*, pass forwards on each side to the pons Varolii, the *superior peduncles* passing upwards at each side to the inferior quadrigeminal bodies of the mid-brain, and the *inferior peduncles* passing downwards at each side to be continued into the restiform bodies of the medulla oblongata.

The *medulla oblongata* is the transition stage between the spinal cord and the brain, its diameter increasing as it ascends upwards. The anterior and posterior median fissures of the spinal cord are continued up the middle of the front and back of the medulla respectively, and longitudinal furrows divide the anterior surface of the medulla into three distinct areas on each side of the median fissure, from within outwards, the *pyramid* (most of the fibres of which, motor nerve fibres, cross from one side to the other at the lower part of the medulla, the *decussation of the pyramids*), the *olive*, a bulging eminence, and the *restiform body*. Similarly the posterior surface is divided, from within outwards, into the *funiculus gracilis* expanding into the clava, the *funiculus cuneatus* expanding into the *cuneate tubercle*, and the narrow *funiculus of Rolando* expanding into the prominent *Rolandic tubercle*. The central canal of the spinal cord is continued up the lower part of the medulla, and opens into the fourth ventricle of the brain upon the back of the upper part of the medulla, which constitutes the lowest part of the floor of the ventricle. The medulla is composed of nerve fibres connecting the brain and the spinal cord, forming the white matter, and also irregular small masses of nerve cells, forming the grey matter, scattered irregularly through the white matter.

The *average weight* of the human male brain is between 48 and 49 oz., the female brain being lighter, but only in proportion to the lighter weight of the female body. The weight and size of the brain have nothing to do with the intelligence, which is demonstrated, as has already been mentioned, by the prominence and distinctness of its surface convolutions.

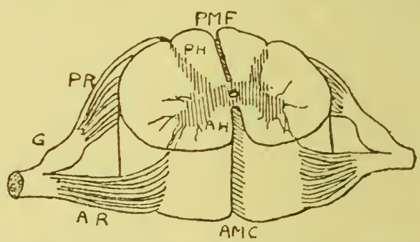
Physiology of the Brain.—The functions of the *cerebrum* are connected with the higher faculties, the will, the intelligence, the senses, the control of movements of the body, while the cerebrum has also a controlling influence on the functions of the other parts of the brain and of the nervous system generally. It has been shown by experiment that different parts of the cerebrum have different functions, but the precise functions of the greater part of the brain have yet to be discovered. The frontal lobes are the seat of the intellectual faculties, the occipital lobes are associated with the sense of sight, the temporal lobes, immediately below the fissure of Sylvius, with the sense of hearing, and, on their internal surface, with the senses of taste and smell. The centre controlling speech is on the left inferior frontal convolution, *Broca's convolution*, while the post-central convolution, immediately behind the fissure of Rolando, is associated with muscular sense. The area of the cerebral cortex controlling the movements of the different parts of the body has been mapped out with singular exactness, and occupies the præcentral convolution, immediately in front of the fissure of Rolando, the area on the one side of the brain controlling the movements of the opposite side of the body. The area controlling movements of the leg is at the upper end of the præcentral convolution, then comes the trunk area, the arm area lower, but still above the middle of the convolution, then the neck area, the face area lower still, and the tongue area lowest. Farther in front of the middle of the convolution is the area controlling the eyes and head. The functions of the *cerebellum* are associated with the co-ordination of movements, while it gives force and tone to the general nervous system, qualities which have been found to disappear when it is removed. In the *pons Varolii* and *medulla oblongata* are centres governing the respirations, the beating of the heart, swallowing, vomiting, and other important physiological processes.

The **cranial nerves,** which arise directly from the brain, are arranged in twelve pairs. The *first*, or *olfactory* nerve, is the nerve of smell, and has a slender stem which arises in front of the anterior perforated spot, proceeds close beneath the frontal lobe, and ends in a bulb there, from which nerve filaments are given off to the nose. The *second*, or *optic* nerve, is the nerve of sight, and arises on each side of the brain from the optic thalamus and corpora quadrigemina, coming round in front to meet its fellow of the opposite side at the optic chiasma, where half the nerve fibres of each side cross to the other; from here the optic nerve proper passes through the optic foramen to the orbit and is distributed to the retina. The *third*, or *oculomotor* nerve, supplies four of the muscles which move the eyeball—the superior, inferior, and internal rectus, which turn the eye respectively upwards, downwards, and inwards, the inferior oblique, which gives it an upward turn, and also the levator palpebræ superioris, which lifts the upper eyelid; it leaves the brain immediately in front of the pons Varolii and passes into the orbit through the sphenoidal fissure. The *fourth*, or *trochlear* nerve, winds round the pons Varolii as it leaves the brain, and supplies the superior oblique muscle of the eyeball which gives a downward turn to the eye. The *fifth*, or *trigeminal* nerve, leaves the brain by a broad root at the side of the pons Varolii, and proceeds forwards to the apex of the petrous portion of the temporal bone, near the centre of the base of the skull, where it expands into a broad ganglion, the *Gasserian ganglion*. From this, three divisions of the nerve go forwards, the *ophthalmic*, the *maxillary*, and the *mandibular*, which are sensory nerves, and with the last is associated a motor nerve to the muscles of mastication. The ophthalmic division of the fifth nerve breaks up into the frontal nerve, which supplies the upper part of the scalp, the forehead, and the inner part of the eyelids; the lachrymal nerve, which supplies the lachrymal gland and the outer part of the eyelids; and the nasal nerve, which supplies the nasal cavity and the surface of the nose. The maxillary division of the fifth nerve breaks up into the posterior, middle, and anterior dental branches, to the teeth of the upper jaw, and palpebral, nasal, and labial branches, to the lower eyelid, side of nose, and upper lip respectively. The mandibular division of the fifth nerve, in addition to the motor branch, breaks up into the lingual nerve, which supplies the anterior part of the tongue, the inferior dental nerve, supplying the teeth of the lower jaw and giving a terminal branch to the surface of the chin, and the auriculo-temporal nerve, going backwards to supply the parotid gland, the skin on the outer side of the ear, and the side of the scalp.

The *sixth*, or *abducent* nerve, leaves the brain immediately below the pons Varolii, and goes through the sphenoidal fissure of the orbit to supply the external rectus muscle of the eyeball which turns the eye outwards. The *seventh*, or *facial* nerve, supplies by its branches all the muscles of the face except the muscles of mastication, and supplies in addition the occipitalis, retrahens aurem, stylo-hyoid, and posterior belly of the digastric; it leaves the brain between the pons Varolii and the cerebellum, passes with the auditory nerve into the internal auditory canal, emerges under the mastoid process from the stylo-mastoid foramen, and reaches the face after traversing the parotid gland. The *eighth*, or *auditory* nerve, leaves the brain between the pons Varolii and the cerebellum, external to the seventh nerve, with which it passes into the internal auditory canal, to be distributed to the internal ear: it consists of two parts; one of them, the nerve of hearing proper, supplying the cochlea, and the other supplying the semicircular canals, which are concerned in maintaining the equilibrium of the body. The *ninth*, or *glosso-pharyngeal* nerve, is the nerve of taste; it leaves the medulla oblongata between the olive and restiform body and, with the tenth and eleventh nerves, passes through the jugular foramen to the neck, where it proceeds forwards between the lower jaw and the hyoid bone; it supplies the back of the tongue and also gives branches to the tonsil and epiglottis. The *tenth*, or *vagus* nerve, is partly motor and partly sensory; it leaves the medulla oblongata between the olive and restiform body immediately below the root of the ninth, accompanies that nerve and, more intimately, the eleventh through the jugular foramen, then passes down the neck in the carotid sheath and enters the thorax behind the great veins; it gives branches to the pharynx, larynx, œsophagus (in front of the lower part of which it forms a plexus with the vagus nerve of the other side), stomach, respiratory tract, and lungs, while the left vagus is connected with the hepatic nerve plexus, and the right with the cœliac, splenic, and renal plexuses.

The *eleventh*, or *spinal accessory* nerve, is composed of one part which leaves the medulla oblongata immediately below the root of the vagus, eventually joining the vagus lower down and supplying the larynx, and another part which arises by several roots from the spinal cord and supplies the sterno-mastoid and trapezius muscles. The *twelfth*, or *hypoglossal* nerve, is the motor nerve which supplies the tongue, giving also branches to the larynx and the thyro-hyoid and genio-hyoid muscles; leaving the medulla oblongata in front between the pyramid and the olive, it passes through the anterior condylic foramen at the margin of the foramen magnum of the skull, and proceeding down the neck arches forwards towards the hyoid bone to reach the tongue.

The **spinal cord** is that part of the central nervous system which lies within the spinal or vertebral canal. It is from sixteen to eighteen inches in length, extending from the opening in the base of the skull, where it becomes continuous with the medulla oblongata, to the upper border of the second lumbar vertebra, below which point it is represented by a thread-like structure, not of nervous tissue, termed the *filum terminale*. Like the brain, it is enclosed in three membranes, the *pia mater*, closely applied to the cord, the *arachnoid mater*, a delicate middle membrane, and the *dura mater*, less closely applied, however, to the vertebral column than that of the brain is to the skull.



SECTION OF SPINAL CORD.—*PMF*, posterior medium fissure; *AMF*, anterior medium fissure; *PH*, posterior horn of grey matter; *AH*, anterior horn of grey matter; *PR*, posterior root; *G*, ganglion; *AR*, anterior root.

The spinal cord is a somewhat flattened cylinder, thicker in the cervical region, where the nerves forming the brachial plexus leave it, and in the lumbar region, where the nerves forming the lumbar and sacral plexuses have their origin from it. It is divided into halves by the anterior median fissure in front and the posterior median septum behind, which are best observed in a transverse section of the cord, the anterior median fissure being wider but much less deep than the posterior median septum. Like the brain, the spinal cord consists of grey and white matter, the grey matter being arranged, as is seen on transverse section of the cord, in a crescentic form in the centre of each lateral half of the cord, the two being joined by a bar in the middle, so that the whole has roughly the shape of the letter H. In the centre of the middle bar, or *grey commissure*, is the central canal, which extends throughout the length of the cord, and is continuous above with the fourth ventricle of the brain. The anterior limbs of the H-shaped grey matter are termed the *anterior horns*, and are larger and broader than the posterior limbs, or *posterior horns*. With the anterior limbs the anterior nerve roots, containing motor nerve fibres taking origin from the nerve cells of the anterior horn, are connected, while with the posterior horns the posterior nerve roots are connected, containing sensory nerve fibres taking origin from the nerve cells in the ganglia outside the cord and linking up with the nerve cells of the posterior horn. The white matter of the cord surrounds the grey, passing in front of the grey commissure to join the white matter of the other side and forming the *white commissure*. It is composed of nerve fibres and of neuroglia, and is arranged in definite longitudinal tracts, which have been mapped out by various experimental methods, but which are not visible in a transverse section of the cord on examination by the naked eye or by the microscope. The posterior column, between the posterior nerve roots and the posterior median septum, is composed of the *tract of Goll*, next to the septum, and the *tract of Burdach*, next to the posterior nerve roots, the *comma tract of Schultze* being in the middle of the tract of Burdach. The lateral column, on the external aspect of the cord between the posterior and anterior nerve roots, is composed, from behind forwards, of first, the *tract of Lissaner*, on the surface beside the tip of the posterior horn; then, externally, the *direct cerebellar tract;* internally, the *crossed pyramidal tract;* farther forward, externally, the *tract of Gowers;* and, internally, the *antero-lateral ground bundle*, which includes part of the column on the internal side of the anterior nerve roots. On the side of the anterior fissure is the *direct pyramidal tract*.

The *direct* and the *crossed pyramidal tracts* contain the motor fibres from the cortex of the brain running to the anterior horn of grey matter, forming the upper segment of the path of motor impulses, while the other tracts conduct sensory nervous impulses upwards to the brain, or contain fibres which form connections for nerve cells at different levels in the cord.

The nervous system is built up of an aggregation of *neurons*, a neuron consisting of a nerve cell which gives off a number of branching processes, and also one branch which is a nerve fibre, termed the axon or axis cylinder: by means of the processes nervous impulses are conducted to the cell, and are then transmitted by the axis cylinder away from the cell, either so as to come into relation with the collecting processes of another cell or to the termination of the axis cylinder in a sense-organ. The path of motor impulses from the brain is in two segments, each composed of a neuron, the axis cylinder of the upper extending from a nerve cell in the motor area of the cortex of the brain to the anterior horn of grey matter in the spinal cord; the axis cylinder conducting the impulses compose the direct pyramidal tract, which is on the side of the anterior fissure, and the crossed pyramidal tract, which is situated internally in the lateral column of the spinal cord. The lower segment of the motor path is composed of a neuron which has an axis cylinder extending from a nerve cell in the anterior horn of grey matter of the spinal cord, the processes of which come into relation with the axis cylinder of the upper neuron, to the termination in a muscle. The path of sensory impulses is in three segments, the lowest being a neuron with its nerve cell (from which a process goes to the muscles, skin, or mucous membranes) in the ganglion of the posterior root of a spinal nerve, and the axis cylinder going into the spinal cord, where it takes part in the composition of one of the tracts of white matter, ending eventually in the medulla oblongata. In the medulla oblongata it comes into relation with the processes of the nerve cell of the neuron of the second segment of the path, and the impulse is transmitted by the axis cylinder of this nerve cell to the brain, where it ends in one of the internal nuclei of grey matter. The upper segment of the path consists of a neuron composed of a nerve cell in the nucleus of grey matter, the processes of which come into relation with the termination of the axis cylinder of the second neuron, which sends an axis cylinder to come into relation with the processes of one of the motor nerve cells of the motor area of the brain cortex.

Reflex action, as, for instance, when the foot is moved automatically in response to tickling the sole, is brought about by the nervous impulse travelling by the afferent sensory fibres to the nerve cells in the ganglion of the posterior root of the spinal nerve, being then short-circuited by a branch from this nerve cell to the nerve cell of the lower segment of the motor path in the anterior horn of grey matter of the spinal cord, and being then transmitted by the efferent motor fibres to the muscles.

The **spinal nerves** arise in a series of thirty-one pairs, from each side of the spinal cord. Each nerve is attached to the spinal cord by two roots, an anterior and a posterior, the former containing motor fibres and the latter sensory fibres, the two roots joining together before leaving the spinal canal. The posterior root has on it, just before it joins the anterior root, an oval swelling or *ganglion*, containing the nerve cells of the sensory nerve fibres. The united nerve leaves the spinal canal through a space between two adjacent vertebræ, and divides into a posterior and an anterior division, each of which contains both sensory and motor fibres. The posterior division divides again into branches supplying the muscles and skin of the back. The anterior division first gives off a branch to and receives fibres in return from the sympathetic system, and then proceeds round the trunk, giving off a lateral branch to the muscles and skin of the trunk, and ending in front of the body in a cutaneous branch. The nerves in the dorsal region preserve this simple arrangement, but in the cervical, lumbar, and sacral regions, through the development of the limbs, the symmetry is altered. In these regions the nerves divide and join with one another to form plexus from which proceed branches for the nervous supply of the limbs; the fourth to the eighth cervical and the first and second thoracic spinal nerves are involved in the brachial plexus, the last thoracic and the first four lumbar spinal nerves in the lumbar plexus, the fourth and fifth lumbar and first three sacral nerves in the sacral plexus, and the spinal nerves below the third or fourth sacral in the less important pudendal plexus.

The *brachial plexus* divides into three main nerve trunks, termed the *outer, inner,* and *posterior cords,* which supply the muscles and skin of the different parts of the body in the region as follows. From the *outer* and *inner cords* are derived the nerve to the subclavius and the external and internal anterior thoracic nerves (distributed to the front of the chest), the musculo-cutaneous nerve (distributed to the front of the arm and forearm), the lesser internal cutaneous nerve (distributed to the inner side of the arm), the internal cutaneous nerve (distributed to the front of the arm and forearm), and the median and ulnar nerves (distributed to the front of the forearm and hand). From the *posterior cord* are derived the posterior scapular, posterior thoracic, suprascapular, short subscapular, lower subscapular, long subscapular, and circumflex nerves (distributed to the region of the shoulder), the intercosto-humeral nerve (distributed to the inner side of the arm), and the musculo-spiral nerve (distributed to the back of the arm, forearm, and hand).

From the *lumbar plexus* the following nerves are derived: muscular branches to the quadratus lumborum and psoas muscles, the ilio-hypogastric nerve (the iliac branch distributed to the buttock and the hypogastric branch to the abdominal wall), the ilio-inguinal nerve (distributed to the abdominal wall, the thigh, and the perineum), the genito-crural nerve (the genital branch distributed to the groin and the crural branch to the front of the thigh), the external cutaneous nerve (distributed to the outer side and the front of the buttock and thigh), the obturator nerve (distributed to the inner side of the thigh and the back of the knee), and the anterior crural nerve (distributed to the front and the inner side of the thigh, leg, and foot).

From the *sacral plexus* are derived, from anterior trunks, the following muscular branches to muscles in the region of the buttock and the back of the thigh: the nerve to the ham-strings, the nerve to the obturator internus and superior gemellus, and the nerve to the quadratus femoris and inferior gemellus. The following nerves, derived from posterior trunks, also supply muscles in the region of the buttock and back of the thigh: the superior and inferior gluteal nerves, nerve to the pyriformis, and nerve to the short head of the biceps; the peroneal nerve supplies the front of the leg and foot, and the tibial nerve supplies the back of the knee, leg, and sole of the foot, while articular branches to the hip-joint and the knee-joint are also derived from the sacral plexus. The great sciatic nerve, which is the largest nerve in the body, is composed of a bundle of nerves from the sacral plexus, comprising the nerves to the hamstrings, the nerve to the short head of the biceps, and the tibial, the peroneal nerves.

The *pudendal plexus* comprises visceral branches (distributed to the pelvic nerve plexus and eventually to the pelvic organs), the small sciatic nerve (distributed to the skin only of the perineum, buttock, thigh, and leg), the perforating cutaneous nerve (distributed to the skin of the lower part of the buttock), the pudic nerve (distributed to the perineum), muscular branches to the levator ani, coccygeus, and external sphincter muscles, and the anterior-sacro-coccygeal nerves (distributed to the skin in the region of the coccyx and behind the anus).

The *sympathetic system* is composed of a series of ganglia united with one another by nerve cords running on each side of the vertebral column; the ganglia are three in number in the cervical region, in number corresponding to the vertebræ in the dorsal, lumbar, and sacral regions, and one ganglion in the coccygeal region. From each ganglion a nerve of grey fibres goes to the corresponding cranial or spinal nerve and from it a branch is received in return. Branches also go from the ganglia to the blood-vessels and to the internal organs, uniting with each other to form intricate plexuses in some of which are found ganglia. The chief of these plexuses are: that situated behind the pharynx; that on the œsophagus; that in the arch of the aorta; that in front of the bifurcation of the aorta; the *solar plexus* behind the stomach and around the cœliac axis of the aorta, with which are associated the two *semilunar ganglia;* the *hypogastric plexus* below the bifurcation of the aorta; while plexuses are also formed around the rectum, bladder, prostate (in male), uterus and vagina (in female).

The sympathetic fibres which supply the muscular walls of the blood-vessels regulate their contraction and dilatation, and are termed *vaso-motor* fibres. Branches from the different sympathetic ganglia control the dilatation of the pupil of the eye, the secretions of the sweat-glands, the movements of the alimentary canal and the secretions of the salivary glands, glands of the stomach and intestine, liver and pancreas; the sympathetic fibres convey augmenting and accelerating impulses to the heart; by the vaso-motor fibres to their blood-vessels are controlled the dilatation or contraction of the spleen, kidneys, and other abdominal viscera; while the sympathetic fibres convey motor impulses to the bladder, colon. rectum, penis, uterus, and vagina

THE SPECIAL SENSES AND THE SKIN

The sense organ of *sight* is the eye, the essential part of which is the *eyeball,* contained in a bony cavity in the front of the skull, the *orbit,* communicating with the brain by the optic nerve, and moved in the cavity by a set of small muscles.

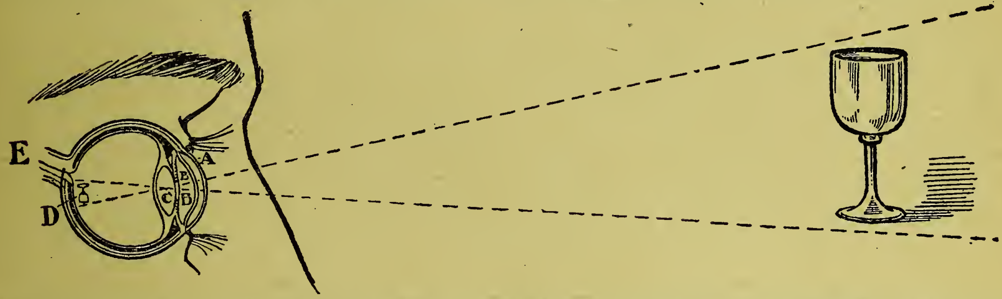
The eyeball is an almost perfect sphere of about an inch in diameter, the front part bulging slightly forwards. It has three coats, the outer protective fibrous covering, or *sclerotic,* being white and opaque except in the more prominent front part, where it is transparent and forms the *cornea,* a fine canal, the canal of Schlemm, running round the eyeball at the point of junction of the opaque and transparent parts. The sclerotic is continued behind on to the optic nerve which pierces it. The middle coat consists of the *choroid membrane*, the *ciliary processes*, and the *iris*, the first of which does not extend quite so far forwards as the canal of Schlemm, being deeply coloured with pigment cells and containing a great number of fine blood-vessels running in it; the ciliary processes extend radially round the eyeball at the junction of the sclerotic and cornea, containing the radiating fibres of the ciliary muscle, the function of which is to regulate the lens in accommodating the eye to near objects; while the iris is a thin, coloured, membranous curtain hanging in front of the lens of the eye, perforated in the middle with a circular hole, the *pupil*, for the transmission of light.

The inner coat of the eyeball is a delicate structure termed the *retina*, which becomes thinner towards the front of the eye, the nervous part of it ending behind the commencement of the ciliary processes, while the pigmented part is continued on to the back of the iris. The retina is composed of eight layers of nervous structures: (1) the pigmented layer, formed of pigmented, hexagonal, flat cells; (2) the layer of rods and cones, minute nervous structures which receive the impressions of light, the rods being more numerous except at an area like fibres, the effect of which is to increase the refractive power of the lens.

The vitreous humour occupies the posterior chamber of the eye, behind the lens, and is a soft, transparent jelly of practically the same composition as the aqueous humour, contained within a fine hyaloid membrane.

When a luminous object is in front of the eye the rays from it strike the cornea and converge from it slightly to pass through the aqueous humour. Those rays of light which fall on the parts of the cornea farthest out are shut off by the iris, the central rays being allowed to pass through the pupil to the lens, which, having a high refractive index, greatly converges them. The rays then pass through the vitreous humour and are brought to a focus on the sensitive retina, forming there an inverted, but otherwise exact, image of the object in front of the eye, and this impression is transmitted by the optic nerve to the brain.

The size of the pupil can be increased or diminished according as the intensity of the light is less or greater, the amount of light entering the eye being modified so that the image brought to a focus upon the retina is sharply defined. The eye



A, is the cornea or outer part of the eye; *B*, *B*, the iris or coloured part, in the centre of which is the pupil, or window of the eye, through which the rays of light pass and are focussed by *C*, the lens of the eye, impressing the image of the glass on the retina *D*, the sense of sight being conducted by the optic nerve *E* to the brain.

in the middle of the retina, the *yellow spot*, the point of keenest vision in the eye, which has only cones; (3) outer granular layer of oval cells; (4) outer molecular layer of interlacing cell branches; (5) inner granular layer of oval cells; (6) inner molecular layer of interlacing cell branches; (7) layer of large nerve cells; (8) layer of nerve fibres, which go to the optic nerve. That part of the retina where the optic nerve enters is insensitive to light, and is known as the "blind spot."

The eyeball contains three refractive media through which the rays of light pass, the *aqueous humour* in front, the *crystalline lens* in the middle, and the *vitreous humour* behind.

The aqueous humour is a clear, watery fluid contained in the anterior chamber of the eye, between the cornea and the lens, and is composed of water with a very slight solution of albumen and salt in it, believed to be secreted by the choroid membrane.

The crystalline lens is held in position by ligaments from the ciliary processes, and is situated behind the pupil, in contact with the iris, making a depression into the vitreous humour behind it. It is convex on both sides, and is composed of a great number of thin layers of transparent, ribbon-

is accommodated for objects of varying distances, in order that exact images may be focussed upon the retina, by adjusting the lens, which is brought about by changing the curvature of its anterior surface, through the ciliary muscles contracting and pulling upon the ciliary processes which suspend the lens. In accommodating the eye for near objects the curvature of the anterior surface, and therefore the diameter of the lens, is increased, and, in addition, the pupil is contracted, while in accommodation for distant objects the curvature of the anterior surface, and therefore the diameter of the lens, is decreased, and the pupil is dilated.

On the surface of the layer of rods and cones of the retina is a layer of cells, containing dark pigment, which send processes down among the rods and cones. When the eye is at rest these processes are very short, but under the stimulus of light they are sent more deeply among the rods and cones, and it is believed that the light causes decomposition of the pigment, the substance thus formed stimulating the rod and cone nerve-endings.

Colour perception is attributed to different colour-rays causing different chemical changes and thus producing different distinctive stimuli of the nerve endings. Another explanation of colour perception, the physiology of which is obscure, is that, as the rays of different colours have undulations of varying rapidity, the different colour rays set up different rates of molecular vibration in the nerve endings, and thus send different stimuli to the brain centres.

The muscles which move the eyeball in the orbit consist of the four *rectus muscles, superior, inferior, internal,* and *external,* which move the eyeballs respectively upwards, downwards, inwards, and outwards; the *superior oblique muscle,* which gives the eye a downward and outward turn; and the *inferior oblique muscle,* which gives the eye an upward and outward turn.

The eyelids protect the eye in front, and are composed of skin with some fibres of the *orbicularis palpebrarum muscle,* the sphincter of the orbit plates of fibro-cartilage, termed the *tarsal plates,* glands which lubricate the edges of the lids, large modified sweat glands (which, when inflamed, cause the well-known "stye"), and a layer of mucous membrane which covers the back of the eyelids and also the front of the eyeball, termed the *conjunctiva.*

The lachrymal gland secretes the tears, which bathe and prevent irritation of the cornea and conjunctiva, and is situated in the upper and outer part of the orbit, several ducts from it opening upon the upper part of the conjunctiva. The tears are conveyed away by two small canals from the inner angle of the eye communicating with the nasal cavity.

The sense-organ of *hearing* is the **ear**, which is divided into three parts, the external, the middle, and the internal ear. The *external ear* consists of two parts, the *auricle* or *pinna,* a fibro-cartilaginous framework covered with skin, the purpose of which is to catch the vibrations of the air, and the *auditory meatus,* a bony, and in part cartilaginous, canal passing into the temporal bone and ending at the *tympanic membrane* which separates it from the middle ear. The auditory meatus is lined with skin, the glands of which secrete wax. The *middle ear,* or cavity of the tympanum, is a small cavity situated in the petrous portion of the temporal bone, the purpose of which is to transmit to the internal ear the sounds which strike the tympanic membrane. It is filled with air, conveyed to it from the back of the nasal cavity by the partly cartilaginous, partly bony, *Eustachian tube,* so as to preserve a more uniform temperature, to increase the action of the sound conveyers, and to keep the pressure equal on each side of the tympanic membrane. Between the middle ear and the internal ear are two fine membranes covering little openings called the *fenestra rotunda* and the *fenestra ovalis;* and the vibrations caused by sounds are transmitted from the tympanic membrane to the membrane of the fenestra ovalis, and thus propagated to the internal ear by a chain of little bones in the middle ear, called from their shapes the *malleus, incus,* and *stapes* (*i.e.* hammer, anvil, and stirrup). In the middle ear there are two little muscles, the *tensor tympani,* the larger of the two, arising from the roof of the Eustachian tube and being inserted on the handle of the malleus, its action being to pull the handle of the malleus inwards and so make the tympanic membrane tense; the *stapedius* muscle arises from a projection on the wall of the cavity, and is inserted on the head of the stapes, its action being to pull the head of the stapes backwards, and antagonise the tensor tympani. The *internal ear* is composed of a series of cavities in the petrous portion of the temporal bone, comprising the vestibule, the central cavity, into the superior part of which open three canals, named from their shape the *semicircular canals,* while the front part of the vestibule is prolonged into a spinal canal resembling the shell of a common snail, the *cochlea.* A spiral bony shelf, projecting from the centre of the coil, divides the canal of the cochlea incompletely into two passages, the upper termed the *scala vestibuli* and the lower the *scala tympani,* which communicate at the top. Within the bony cavities is contained a series of membranous canals which closely follow them in shape, but, being much smaller in calibre, are not in close contact with their walls. Between the walls of the two series of canals is a space filled with a special fluid, the *perilymph,* while the membranous canals themselves are filled with another fluid, the *endolymph.* In the vestibule the membranous labyrinth is divided into a small sac, the *saccule,* into which the membranous canal of the cochlea opens; a larger sac, the *utricle,* into which the membranous semicircular canals open; and a slender canal, the *endolymphatic duct,* which communicates with both sacs and ends in a slight dilatation on the surface of the bone, under the dura mater. The membranous semicircular canals have a diameter of only about a quarter of that of the corresponding bony canals, and at one end of each canal is a large dilatation, or *ampulla,* into which the hairs of hair cells project. The membranous cochlea, or *cochlear duct,* lies in the bony cochlea between the free edge of the dividing shelf and the outer wall, having the scala vest buli above and the scala tympani below. Along the base of the membranous cochlear duct extends a minute structure, the *organ of Corti,* the essential part of which consists of hair cells projecting into the endolymph.

The auditory nerve consists of two parts, the vestibular division and the cochlear division. The former divides into three branches, which are distributed to the utricle, and to the ampullæ of the superior and external semicircular canals respectively; the cochlear division gives off branches to the saccule and to the ampulla of the posterior semicircular canal, and is then distributed to the hair cells of the organ of Corti.

Physiology of the Ear.—The sensation of sound is the impression on the brain caused by a body being set in vibration, the vibrations being transmitted by air-waves to the ear, converted by the mechanism of the ear, and conveyed by the auditory nerve to the brain. Impinging upon the external ear, the air-waves are reflected into the auditory meatus until they strike the tympanic membrane. The vibrations are then transmitted by the chain of ossicles, the malleus attached to the tympanic membrane, the incus in the middle, and the stapes, the base of which is attached to the membrane that closes the fenestra ovalis of the internal ear. The base of the stapes is moved inwards or outwards, and the perilymph, or fluid in the bony canals, receives corresponding impulses which set up waves in it. The waves are transmitted to the endolymph, or fluid in the membranous canals, and the nerve endings of the different branches of the auditory nerve are affected by the waves of the endolymph. The utricle and saccule can only perceive sounds as sounds, and cannot differentiate in regard to their pitch or quality; the analysis of tone is the function of the cochlea. The waves of the endolymph irritate the hair cells of the organ of Corti, and the delicate nerve filaments to the hair cells are affected and communicate the sensation to the auditory centre of the brain. The function of the semicircular canals is concerned with the sense of equilibrium, the waves of the endolymph caused by change of position irritating the hair cells of the ampullæ of the canals, and their nerve filaments in turn conveying the impression to the brain.

The sense-organ of *smell* is situated in the **nose**, which is placed in the middle of the face, and may be considered as divided into an external or projecting part, and an internal part or nasal cavities. The upper part of the nose is formed by the nasal bones proper and by the nasal processes of the superior maxillary bones. At the lower part are two horizontally placed openings, the nostrils, across which some stiff hairs usually project, forming passages into the internal part of the nose. These passages are separated by a vertical cartilaginous septum, continuous with the vomer bone and the perpendicular plate of the ethnoid bone, while the outer walls of the passages are formed on each side by an upper lateral and a lower lateral cartilage, several small *sesamoid* cartilages being attached to the latter behind. To these are attached the small and feeble muscles of the nose, comprising the *pyramidalis nasi*, arising from the skin above the root of the nose and attached to a membrane covering the outside of the nose, the *compressor naris*, arising from the superior maxilla and attached to the same membrane, the slight *dilatores naris*, at the sides of the nostrils, the *depressor alæ nasi*, arising from the superior maxilla just below the nose and inserted into the septum and the sides, and the *levator labii inferioris alæque nasi*, arising from the nasal process of the superior maxilla and inserted into the side of the nose and the upper lip.

The internal nose or nasal cavity is divided into three passages or meatuses by *turbinated* or spongy bones which project into them from the outer wall, the two upper turbinated bones being shelf-like projections from the ethmoid, while the lowest is a small, separate, bony plate, articulated with the ethmoid, superior maxillary, and palate bones. There are a number of air cells or sinuses in the ethmoid, sphenoid, superior maxillary, and frontal bones, which communicate by small openings with the nasal cavity. The nasal cavity ends at the upper part of the pharynx, where the passages terminate by a vertical slit above the soft palate and in front of the opening of the Eustachian tube, at each side.

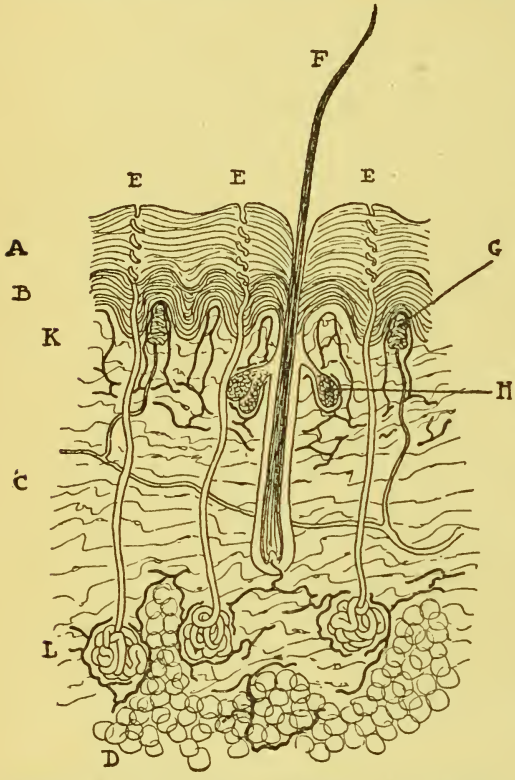
The internal nose is lined with mucous membrane, the lower two-thirds being covered with ciliated epithelial cells, while in the upper third, or *olfactory area*, the cells are not ciliated, and here are situated the special olfactory cells with supporting cells. These olfactory cells are narrow and columnar, each with its nucleus placed at the lower end, while from the upper end a number of hairs project. Each olfactory cell is connected below with a fine nerve filament joining an olfactory nerve fibre which, passing through the cribriform plate of the ethmoid bone to the olfactory bulb, conveys impulses to the brain.

In order to cause the sensation of smell a substance must be in the form of a vapour, the particles of which irritate the hairs of the olfactory cells and thus set up corresponding impulses to the brain.

Taste is the function of special sense-organs which have their situation mainly in the **tongue**. The mucous membrane of the tongue has upon it a great number of little projections, or papillæ, which are of three kinds: *filiform*, scattered over the whole of the superior surface of the tongue, comparatively long projections with several fine filaments at their free ends; *fungiform*, chiefly present towards the point and at the sides of the tongue, rounded mushroom-like projections; and *circumvallate*, about ten or twelve in number, situated at the back of the tongue, arranged in a V pointing backwards, which, instead of being actual projections, are simply little areas of the mucous membrane separated off by little circular trenches, in the inner walls of which are situated the *taste-bulbs*. The taste-bulbs are minute circular bodies from an opening in one end of which five hairs project, while an end filament of a nerve enters at the other end. In addition to these taste-bulbs, which are stimulated by certain substances, there must be other sense-organs of taste in the tongue which have not yet been recognised, for the sensation of taste can be perceived elsewhere in the tongue than in the area where the taste-bulbs are situated. Many so-called tastes are, however, in reality smells, the olfactory sense being much more sensitive than the sense of taste, as, for instance, an apple cannot be distinguished from a potato by taste alone. The nerves from which branches come to the taste sense-organs are the lingual, which supplies the front of the tongue, and the glosso-pharyngeal, which supplies the back.

The **skin** forms a complete covering of the whole body, and consists of two main layers, the *epidermis* or *scarf-skin* being the outer, and the *dermis* or *true skin* the inner. The *epidermis* on microscopical examination is seen to be composed of five layers, the *first* of horny scale-like cells; the *second*, or *stratum lucidum*, is a thin layer of scale-like cells without horny material; the *third* a thin layer of more swollen cells containing granules; the *fourth*, or *stratum mucosum*, is a deeper layer of polygonal cells connected with one another by minute "prickles," and in them is found the pigment of the skin of the coloured races; while the *fifth* consists of one layer of elongated cells.

The *dermis* is a vascular structure, a network of white fibrous tissue with some elastic fibres, and is composed of two layers, that nearer to the epidermis being raised into projections or papillæ which project into corresponding depressions in the under surface of the epidermis. These papillæ contain loops of blood-vessels, and many of them contain a *touch corpuscle*, in which nerve filaments end, and which is one of the special sense-organs of touch. In certain parts of the body, *e.g.* the tips of the fingers, the papillæ are especially prominent, and cause the epidermis to fall into parallel ridges, characteristic of these parts. In the deeper layer of the dermis the structure is looser, and there is usually a considerable deposit of fat; there are many blood-vessels and nerves present, while the *hair follicles* and the *sebaceous glands* (which pour a fatty secretion into the upper part of the hair follicles to lubricate the hairs) are situated in this layer. A hair follicle is divided into an inner and an outer sheath, each formed of distinct layers of cells, and, enlarging below to form a bulb into which a loop of blood-vessel projects, is attached to the skin by a minute band of muscle fibres, the



SECTION OF SKIN (GREATLY MAGNIFIED).—*A*, upper skin; *B*, rete malpighii; *C*, under skin; *D*, fat cells; *E*, pore, *i.e.* opening of sweat duct from sweat gland; *F*, hair; *G*, touch corpuscle, connected with nerve; *H*, sebaceous gland; *K*, superficial plexus of blood-vessels; *L*, deep plexus of blood-vessels.

erector muscle of the hair which, by contracting, causes a hair to stand on end. From the lower end of a hair-follicle develops a more or less rigid axis which projects out into the exterior and there continues to lengthen, being termed a *hair*. The *sweat glands*, which are most numerous on the palms and soles, consist of minute tubes, the lower parts of which form spherical coils in the deeper parts of the dermis or in the subcutaneous tissue immediately below. The sweat, like the urine, is an excretion of the body, the secreting glands getting rid of substances which have been formed elsewhere in the body, and it contains practically the same salts as the urine does and in the same relative amount. Normally the sweat is evaporated as soon as it reaches the surface of the body, and it is only when the amount is increased, as by violent exercise or strong heat, or when evaporation is prevented, that drops of sweat appear on the skin. The salts in solution in the sweat are only in minute proportion to the water, and during twenty-four hours about two pounds of sweat are excreted by a man. The *nails* are specially modified parts of the epidermis to protect the sensitive ends of the fingers; beginning at the root, which is covered by a fold of skin, a nail lies upon a very sensitive and very vascular part of the dermis, the *nail-bed*, and ends at a free margin.

To the skin belongs the sense of *touch*, the sense-organs of touch in man being of three different kinds, the *end-bulbs*, the *touch corpuscles*, and the *Pacinian corpuscles*, in all of which are the terminations of nerve filaments which join together to compose the peripheral nerve trunks and carry the sensations eventually to the brain. The *end-bulbs* are minute spheroidal bodies formed in the conjunctiva, the lips, and the mucous membrane of the mouth, genital organs, and elsewhere. The *touch corpuscles* are oval bodies rather smaller than the end-bulbs, situated usually in the papillæ of the dermis or true skin, and most common in the palms of the hand and soles of the feet. The *Pacinian corpuscles* are larger than the two former, being oval bodies, as much as one-tenth of an inch in length and about half that in breadth, situated in the subcutaneous tissue, and most common on the under surface of the hands and feet, near joints, and associated with the sympathetic nerves of the abdomen.

The purpose of these special organs of touch is that very slight variations of pressure may be rendered more perceptible by the peripheral nerve endings. It has not yet been definitely found whether there are separate nerve fibres for the perception of different temperatures, but it has been shown that there are different small areas on the skin where sensations of heat or cold are more keenly perceived than elsewhere, *cold spots* being more numerous than *hot spots*.

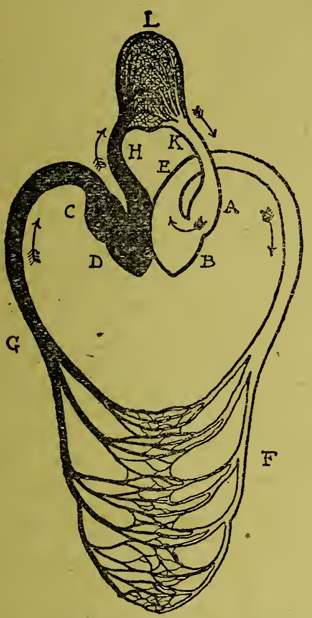
An important function of the skin is the regulation of the temperature of the body. The vaso-motor nerves of the blood-vessels of the skin regulate the amount of blood which passes through the skin. The greater the quantity of blood that passes through the skin the greater is the amount of heat lost by conduction, radiation, and evaporation. On the other hand, when the blood-vessels of the skin are constricted by the action of the vaso-motor nerves the quantity of blood passing is less and the amount of heat correspondingly less. The production of sweat has also a cooling effect, as heat is necessary for its evaporation, and this heat comes mainly from the body.

The skin is of some importance as an organ of respiration, although less so in man than in some of the lower animals (*e.g.* the frog), carbon dioxide being exhaled by the skin (about $\frac{1}{150}$ of the quantity exhaled by the lungs) and oxygen inspired in exchange.

The skin also is an organ of absorption, certain substances, such as cod-liver oil and mercurial preparations, having the same effect when rubbed into the skin as when administered internally by the mouth.

THE CIRCULATORY SYSTEM

The function of the circulatory system is to convey nourishment, which is carried by the fluid called the *blood* to all parts of the tissues of the body. The nourishment consists of oxygen and of the nutritive substances derived from the food; the oxygen is obtained from the air by the agency of the lungs, and the nutritive substances from the alimentary canal either directly or by the inter-



CIRCULATORY SYSTEM (DIAGRAMMATIC).—The arrows indicate the direction of the blood flow, from the lungs (*L*) by the pulmonary veins (*K*) to the left auricle (*A*) and left ventricle (*B*) of the heart, through the aorta (*E*) to the arteries and capillaries of the body (*F*); from the capillaries and veins of the body by the great veins (*G*) to the right auricle (*C*), thence to the right ventricle (*D*) and by the pulmonary artery (*H*) back to the lungs.

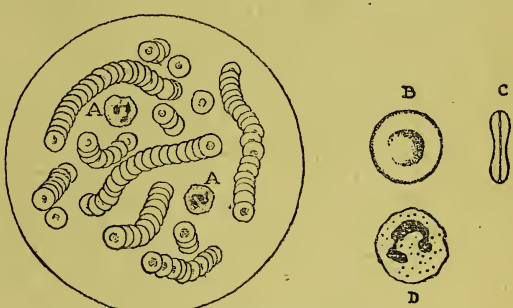
mediary of the lacteals and the lymphatic system. Having nourished the tissues the blood becomes impure, and part of the impurities are got rid of by the kidneys (urea and other salts), part by the skin (urea and other salts in smaller amount), and part, before which it must first return to the heart, by the lungs (carbon dioxide), while superfluous water is got rid of by all three modes.

The circulatory system consists of two distinct sets of tubular vessels; one set conveys the blood from the left side of the heart to the tissues of the body and, after it has given up its nourishment to the tissues, back to the right side of the heart, while the other set conveys the blood from the right side of the heart to the lungs, where it gives up carbon dioxide and obtains oxygen, and then back to the left side of the heart, from which it is conveyed in the first set of blood-vessels again, and so on.

The organs of the circulatory system include the *heart*, a hollow, four-chambered, muscular organ which pumps the blood through the blood-vessels; the *arteries*, the tubular vessels which convey the blood to the tissues; the *veins*, the vessels which convey the blood from the tissues back to the heart; and the *capillaries*, much smaller vessels which connect the terminations of the arteries with the beginnings of the veins.

The **blood** is a viscid, red fluid, of a salt taste, an alkaline reaction, and a specific gravity of 1·055, which circulates in the blood-vessels in order to carry nourishment to the tissues, to carry away waste products to the excretory organs, and to protect the body against invading organisms. Arterial blood, *i.e.* the blood flowing from the heart, is of a bright scarlet colour, while venous blood, *i.e.* the blood flowing towards the heart, is of a bluish-red colour, the colour of arterial blood being due to the presence of oxygen, which the blood obtains in the lungs and gives up in the tissues.

The blood is composed of a fluid element, or *blood plasma*, which carries food substances and waste products in solution, and *cellular elements*, or *red corpuscles*, *white corpuscles*, and *blood platelets*. In a cubic millimetre of blood there are about 5,000,000 red corpuscles (to which the colour of the blood is due), 8000 white corpuscles, and



Film of blood as seen under the microscope, the red corpuscles lying in *rouleaux*.

A, *A*, white blood corpuscles; *B*, red corpuscle, greatly magnified; *C*, side-view of the same; *D*, white corpuscle, greatly magnified, showing its nucleus or centre.

500,000 blood platelets. In shape a *red blood corpuscle* is a disc, concave on each side, slightly thicker at the edge, and about $\frac{1}{3200}$ of an inch in diameter. It is composed chiefly of nitrogenous material, with which there is, in loose chemical combination, an iron-containing protein called *hœmoglobin*, which has the important property of combining readily with oxygen, yielding it up when its concentration decreases. The red corpuscles thus act as the carriers of oxygen to the tissues. They are found in the red bone-marrow contained in certain bones of the body, such as the ribs, while effete red corpuscles are destroyed in the liver, the resulting debris being excreted in the bile. A *white blood corpuscle* or *leucocyte* is of variable shape, usually irregularly spherical, and, having a diameter of about $\frac{1}{2500}$ of an inch, is slightly larger than a red corpuscle. There are a number of different varieties of white corpuscles, classified according to their microscopical appearance and staining properties. The most numerous are the *polymorphonuclear* leucocytes, about 70 per cent. of the total, each of which has an irregular, complicated nucleus, and contains a number of minute granules which stain readily with eosin. Numbering from about 15 to 30 per cent. of the total are the *lymphocytes*, which are comparatively small in size, each having a large round nucleus surrounded by a narrow rim of clear protoplasm. The *hyaline* leucocytes amount to about 4 or 5 per cent., and each has a large round or oval nucleus, surrounded, however, by a much larger layer of protoplasm than is the lymphocyte. The *eosinophile* leucocytes may number from 2 to 5 per cent. of the total, and have crescentic nuclei, while they contain a number of comparatively large granules which stain readily with eosin. A fifth type of leucocyte is the *basophile*, which is rare except in certain diseases, and contains a round nucleus and a number of large granules which stain readily with basic stains such as hæmatoxylin.

The great value of the white corpuscles is in the power they have of destroying bacteria and inflammatory products, and thus protecting the human body. They are produced in the lymph glands and the lymphoid tissue in other parts of the body, and in the bone marrow, the lymphocytes being derived from the former, and the polymorphonuclears and eosinophiles from the latter. *Blood platelets* are minute circular bodies, about half the size of red corpuscles, and have an important function in connection with the clotting of blood. In the process of clotting, the object of which is to prevent loss of blood when blood-vessels are injured, *fibrin* is precipitated from the plasma in the form of fine threads which interlace in every direction and entangle the corpuscles in their meshes; and during the process fibrin is also believed to be derived from the clumps of blood platelets which are formed.

Resistance to disease caused by bacteria depends upon the power of the white blood-corpuscles to overcome and destroy the bacteria, and by the formation of certain antibodies in the blood which either destroy the bacteria and neutralise their harmful products, or assist the white corpuscles to do so. This power of resistance can be produced or stimulated artificially by the injection of the products of bacteria or their toxins in regulated non-lethal doses.

The **heart** is a cone-shaped, hollow, four-chambered, muscular organ, about the size of the closed fist, which is situated in the central part of the chest, resting upon the diaphragm between the two lungs, and acts as the central pump of the circulatory system. Its base is directed backwards and upwards, and its apex forwards, downwards, and to the left. It is held in place by the great vessels which leave or enter the organ, and by a serous membrane, the *pericardium*, in the form of a double bag, which ensheaths the organ completely, holding the heart in position by its attachment to the upper surface of the diaphragm. The position of the heart may be marked out upon the surface of the chest by drawing a line, curving slightly outwards, from a point on the upper border of the third right rib about an inch from the right border of the sternum to the junction of the sixth costal cartilage with the sternum (this giving the right border of the heart); then drawing another line, curving slightly outwards, from a point on the lower border of the second left rib half an inch from the left margin of the sternum to a point in the fifth left interspace of the ribs about an inch internal to the line of the nipple, or 3½ inches from the middle line of the chest (this giving the left border of the heart); if the upper two points are joined by an oblique line and the lower two points by a line curving slightly downwards, a quadrilateral figure is marked out on the surface which approximates to the position of the heart.

The two upper and posterior chambers of the heart, or the *auricles*, are the receiving chambers for the blood, and each communicates with the corresponding lower and anterior chamber, or *ventricle*, while they have no communication with one another.

The *right auricle* receives the impure or venous blood, which is conveyed to the heart by the *superior vena cava* and the *inferior vena cava*, carrying the blood respectively from the upper and lower parts of the body, and the *coronary sinus*, which carries the venous blood from the substance of the heart itself. The interior of the auricle is smooth except in front and in the pouch-shaped prolongation forwards called the *auricular appendix*, where the wall is thrown into small muscular ridges, and it is lined with a glistening serous membrane, the *endocardium*, as are all the other chambers of the heart. It is into the posterior smooth part of the auricle that the venous blood-vessels open, the apertures of the inferior vena cava and the coronary sinus being guarded by rudimentary valves. In the wall dividing the right from the left auricle is an oval depression, the *fossa ovalis*, which is the remains of a communicating opening between the auricles existing in the child before birth. The communicating opening with the left ventricle is guarded by a valve of three flaps or *cusps*.

The *left auricle* receives the purified blood from the lungs, conveyed to it by the four *pulmonary veins*. (The term "vein," it should be noted, does not necessarily mean a blood-vessel carrying impure or "venous" blood; the term is applied to a blood-vessel which is conveying blood *from* some other part or organ of the body *to* the heart, and thus is properly applied to those vessels which, although carrying "arterial" or purified blood, are leading from the lungs to the heart. In the same way, the *pulmonary artery*, which will be referred to below, is a blood-vessel which is conveying "venous" or impure blood *from* the heart *to* the lungs.) The interior of the left auricle is smooth except in its pouch-shaped prolongation forwards, the *auricular appendix*, where its wall, like that of the right auricle, is thrown into small muscular ridges, and it is lined with endocardium. The pulmonary veins open into the posterior part of the chamber by two openings on each side. In the wall which divides it from the left auricle is a slight oval depression corresponding to the fossa ovalis of the left chamber. The communicating opening with the right ventricle is guarded by a valve of two cusps.

The two lower and anterior chambers of the heart, or *ventricles*, each of which communicates with the corresponding auricle, are the propelling chambers for the blood, and have strong muscular walls.

The *right ventricle* receives the impure or venous blood from the right auricle and pumps it through the *pulmonary artery* to the lungs, where it is purified.

The posterior part of the ventricle communicates with the right auricle, the opening being guarded by the *tricuspid valve.* The flaps or *cusps* of this valve are triangular in shape, and are formed by a double layer of endocardium, their upper or auricular surfaces being smooth, while to their under or ventricular surfaces are joined fibrous cords, *chordæ tendineæ,* which are attached to conical muscular projections, *papillary muscles,* on the walls of the ventricle. The anterior part of the ventricle opens into the pulmonary artery, the opening being guarded by a valve composed of three rounded, pocket-like segments of endocardium, to prevent the blood regurgitating into the ventricle. The interior of the ventricle is lined with endocardium, and is thrown into muscular ridges, one of which, the *moderator band,* bridges from one wall to the other in the lower part of the chamber, to prevent its over-distension, but towards the opening of the pulmonary artery the walls are smooth.

The *left ventricle* receives the purified blood from the left auricle and pumps it through the *aorta,* the main arterial blood-vessel, to the different parts of the body. In its upper and posterior part is the opening by which it communicates with the left auricle, guarded by the *mitral valve.* The two cusps of this valve have the same structure as the cusps of the corresponding valve of the right ventricle, and are likewise attached by chordæ tendineæ to papillary muscles projecting from the ventricular walls. In front and to the left of this valve the left ventricle opens into the aorta, the opening being guarded by a valve of three segments, with the same structure as the corresponding valve of the pulmonary artery. The interior of the chamber is lined with endocardium, and the walls have numerous little muscular ridges except towards the aortic orifice, while the wall separating the left from the right ventricle is also comparatively smooth. This inter-ventricular wall is thick and muscular, and bulges into the right ventricle, which lies in the form of a crescent round the left ventricle.

The *muscular tissue* of which the heart is composed differs in its structure both from ordinary voluntary or striped and involuntary or unstriped muscular tissue. It consists, not of long, narrow, fibre cells, but of quadrilateral cells which have transverse markings less distinct than those of voluntary muscular tissue, and they have also faint longitudinal markings. In the middle of each cell is an oval nucleus. The quadrilateral cells are joined together end to end, and thus form fibres, which do not possess any sheath of sarcolemma. The auricles are divided from the ventricles by a fibrous ring, from which the muscular fibres pass over or across the chambers, many of the bundle of fibres of the ventricles forming figure-of-8 loops. There is, however, one bundle of muscular fibres which passes from the auricles across the auriculo-ventricular ring to the ventricles, passing down the inter-ventricular wall. This is called the *auriculo-ventricular bundle,* and serves to convey the wave of contraction from the auricles to the ventricles. There are special rings of muscular fibres round the openings of the great blood-vessels.

The action of the heart consists, first, of the simultaneous contraction of the auricles, the wave of contraction starting from the ends of the great veins and passing over the auricles, which drives the blood into the flaccid ventricles, the quantity and weight of the blood in the large veins preventing any flow backwards into them. This is followed, after an almost imperceptible pause, by the contraction of the ventricles, the wave of contraction starting at the base and passing to the apex, which drives the blood into the main arteries, the reflux of blood into the auricles being prevented by the closure of the tricuspid and mitral valves. After the contraction of the ventricles there is a pause, when the heart is at rest, then the contraction of the auricles recommences, and so on.

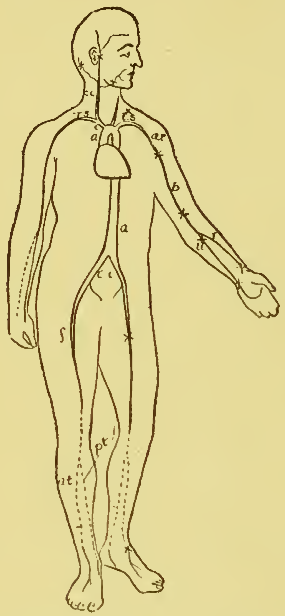
The nerve supply of the heart is through branches which come to it from the nerve plexuses beneath the arch of the aorta, and is thus derived from the two vagus nerves and the sympathetic system, which take part in the formation of these plexuses. These branches enter the muscular walls of the heart, and these join together to form plexuses in which are placed ganglia and ganglion cells. Nerve fibres and ganglion cells are present in considerable numbers practically all over the substance of the heart, but there are parts of it, particularly in the region of the apex, where nerve cells and nerve fibres are completely absent. Experiment has shown that a strip of muscle taken from such a part and kept alive under suitable conditions will continue to beat regularly for a considerable time, thus showing that the contractibility of the heart muscular fibres is a quality inherent in them and not dependent upon nervous stimuli. The brain exercises an inhibiting or arresting power over the heart by the vagus nerves, and an accelerating and augmenting power by the nerve fibres from the sympathetic system.

The substance of the heart receives its own blood supply by the *coronary arteries* and their branches. These arteries, two in number, arise from the right and left sides of the aorta as it leaves the heart, and, running forwards in the auriculo-ventricular groove, divide into branches to supply the muscular walls of the heart. The veins of the heart enter a short venous trunk, the *coronary sinus,* which is placed in the inferior and left part of the auriculo-ventricular groove, and opens into the right auricle. A few minute veins of the heart, however, open directly into the heart chambers.

The *arteries,* or tubular blood-vessels which convey the blood from the heart to the tissues, have walls composed of these coats. The *outer coat* is composed of fibrous tissue with which elastic fibres are intermingled, and in the larger vessels the elastic fibres may be so arranged as to form what may be described as another coat. The *middle coat* is composed of muscular fibres, arranged circularly, slight and incomplete in the capillary vessels, but increasing as the arteries increase in size, until in the larger vessels the greater part of the thickness of the wall is formed by this coat. The *inner coat* has a smooth internal surface composed of a layer of endothelial cells, external to which, in the larger arteries, is a layer of delicate connective tissue, and external to this layer is a network of elastic fibres which forms the greater part of the thickness of the inner coat.

The walls of *veins* are similar in structure to the walls of arteries. The *outer coat* is composed of fibrous tissue and elastic fibres; the *middle coat,* which is much thinner and slighter than the corresponding coat of an artery, contains muscular fibres, which do not form a continuous layer, and connective tissue; while the *inner coat* has a smooth internal layer of endothelial cells, a middle layer of slight connective tissue, and an outer layer of elastic fibres. In the interior of veins are found pouch-shaped *valves*, usually in pairs, composed of a fold of the endothelial layer.

The walls of the smaller *capillaries* are formed of a single layer of endothelial cells, while the larger



THE MAIN ARTERIES OF THE BODY.—*a*, aorta; *i*, innominate; *r.s*, right subclavian; *c.c*, common carotid; *l.s*, left subclavian; *ax*, axillary; *b*, brachial; *r*, radial; *u*, ulnar; *c.i*, common iliac; *f*, femoral; *a.t*, anterior tibial; *p.t*, posterior tibial; ×, pressure points.

capillaries have an additional investing sheath of connective tissue.

The arteries of the body consist of two sets, those which convey the blood to the tissues of the body, the arteries of the *systemic circulation*, and those which convey the blood to the lungs, the arteries of the *pulmonary circulation*.

The main arterial trunk of the *systemic circulation* is the *aorta*, which commences at the upper part of the left ventricle, proceeds upwards and to the right for a short distance, and then, curving upon itself backwards and to the left, it descends through the thorax and through the abdomen as far as the level of the fourth lumbar vertebra, where it ends by dividing into the two common iliac arteries.

The opening of the aorta into the ventricle is guarded by a valve composed of three pocket-like segments, immediately above each of which is a dilatation of the aortic wall called a *sinus of Valsalva*, and from two of these sinuses the coronary arteries take origin. The ascending part of the aorta, about two inches in length, is enclosed within the outer layer of pericardium, and it is in relation to the wall of the right auricle behind, the superior vena cava on the right, and the pulmonary artery, at first in front and then on the left.

About the level of the second costal cartilage the aorta commences to arch, passing backwards and to the left in front of the trachea, then to the left of the trachea, œsophagus, and thoracic duct, over the bifurcation of the pulmonary artery, while overlapped on the left side and in front by the lungs.

From the arch of the aorta spring the *innominate artery* (which divides into the *right subclavian* and *right common carotid* arteries), the *left common carotid* artery, and the *left subclavian artery*. On each side the common carotid artery divides about the middle of the neck into the *external carotid artery* (which supplies the neck and face), and the *internal carotid artery* (which supplies the brain). The subclavian artery gives off a number of branches on each side; the *vertebral artery* (which gives branches to the neck and eventually supplies the brain) branches to the neck, the shoulder, and the upper part of the chest wall; while the main trunk becomes the *axillary artery* in the region of the shoulder (where it gives off several branches), then the *brachial artery* in the upper arm supplying that part with its branches, which divides at the bend of the elbow into the *radial* and *ulnar arteries* of the forearm, and these two eventually form arches in the palm of the hand for the supply of the hand and fingers.

About the level of the fourth thoracic vertebra the arch of the aorta ceases and the descending aorta commences, the portion within the thorax being about seven and eight inches in length. This part of the aorta lies upon the vertebral column, the left lung being in relation on the left side, the thoracic duct and œsophagus, and, lower down, the right lung, in relation on the right side, while in front is first the root of the left lung, then the pericardium and the œsophagus, and lastly the diaphragm, through an opening in which it enters the abdomen.

From the thoracic part of the descending aorta a number of small branches only arise, including several pairs of *intercostal arteries* supplying the thoracic walls and arteries to the bronchi, œsophagus, and pericardium.

After passing through the diaphragm at the level of the last thoracic vertebra the aorta is considered as the abdominal part of the descending aorta, which ends at the level of the fourth lumbar vertebra by dividing into the two common iliac arteries. It lies upon the vertebral column, its anterior aspect covered by the peritoneum, and is in relation, on the right side, to the thoracic duct, the right crus of the diaphragm, and the inferior vena cava; on the left side, to the left crus of the diaphragm; in front of it cross the duodenum and the left renal vein, the solar nerve plexus is in close relation at its upper part, its superior and inferior mesenteric and other branches are at first in close relation to the main trunk, while coils of small intestine are placed in front of it, in the abdominal cavity.

The *branches* of the abdominal aorta are numerous and important. The pair of *inferior phrenic arteries* (to the under surface of the diaphragm) and a number of pairs of *lumbar arteries* (in series with the intercostal arteries, to the abdominal wall) are small branches of less importance. The *cœliac axis* is a short arterial trunk arising from the front of the aorta between the crura of the diaphragm, and has three main branches, *coronary* (to the œsophagus and stomach), *splenic* (to the spleen, with branches to the pancreas and the stomach), and *hepatic* (to the liver, with branches to the stomach and the duodenum). The *superior mesenteric artery* arises from the front of the aorta about half an inch below the aorta, and passes between the two layers of the mesentery, the peritoneal fold which holds the intestines in place. It gives off numerous branches to the small intestine, and to the cæcum, appendix, ascending colon, and transverse colon of the large intestine. The *inferior mesenteric artery* arises from the left side of the aorta about $1\frac{1}{2}$ inches before it bifurcates, and passes down in the abdominal wall behind the peritoneum. It supplies the descending colon, iliac colon, pelvic colon of the large intestine, and the rectum. The pair of *middle suprarenal arteries* spring from the sides of the aorta beside the origin of the superior mesenteric artery, and supply the suprarenal capsules (to which superior branches come from the inferior phrenic and inferior branches from the renal arteries). The pair of *renal arteries* arise from the side of the aorta below the middle suprarenals, and are large arteries supplying the kidneys (and sending inferior suprarenal branches to the suprarenal capsules). The two *spermatic* (in the male) or *ovarian* (in the female) *arteries* are long, slender arteries arising from the front of the aorta about an inch below the renals, passing downwards in the posterior abdominal wall and (in the male) across to the abdominal wings, proceeding through them to the testicles, or (in the female) down to the pelvis to supply the ovaries. The *middle sacral artery* is a small vessel which arises at the bifurcation of the aorta, continuing, in front of the last two vertebræ, the sacrum, and coccyx, in the direction pursued by the aorta.

The two *common iliac arteries* are the arterial trunks formed by the bifurcation of the aorta, commencing at the fourth lumbar vertebra, proceeding outwards on each side behind the peritoneum, and dividing at the sacro-iliac joint of each side into the internal and external iliac arteries. The *internal iliac artery* runs downwards into the pelvis; its anterior division gives off branches to the bladder, rectum, vagina, and uterus (in the female), the *obturator* branch (to the outer wall of the pelvis), *internal pubic* branch (to the perineum and, in the male, the penis), and *sciatic* branch (to the region of the buttock); its posterior division gives off an ilio-lumbar branch to the inner wall of the pelvis, *lateral sacral* branches to the front of the sacrum, a *gluteal* branch of the region of the buttock. The *external iliac artery* runs forward and outwards along the brim of the pelvis, beneath the peritoneum, gives off the branches to the anterior abdominal wall, and passes into the thigh as the femoral artery. The *femoral artery* gives off a large branch, the *profunda femons*, to the deep parts of the thigh, and passes backwards to the space behind the knee, where it is called the popliteal artery, and divides at the lower part of this space into the *posterior tibial artery* (to the back of the leg) and the *anterior tibial artery* (which passes to the front of the leg). The *posterior tibial artery* gives off a large branch, the *peroneal artery*, to the outer side of the leg, with which it forms arches at the ankle, and then ends as the *internal* and *external plantar arteries* in the sole of the foot, the latter anastomising with the terminal branches of the anterior tibial artery on the front of the foot.

The main arterial trunk of the *pulmonary circulation* is the *pulmonary artery*, which arises from the upper and left part of the right ventricle, being rather larger at its commencement than the aorta. It proceeds upwards and backwards somewhat behind the aorta, and, after a course of about two inches, it terminates at the level of the upper margin of the sixth dorsal vertebra by dividing into right and left branches.

The *right branch of the pulmonary artery*, rather the larger and longer of the two, passes outwards and backwards behind the aorta and the superior vena cava under the arch of the aorta and the right bronchus, and enters the root of the right lung, proceeding far down into its substance.

The *left branch of the pulmonary artery* passes outwards and backwards below the arch of the aorta (with which it is connected by the *ligamentum arteriorum*, the remains of a primitive blood-vessel important in the life of the child before birth, *i.e.* before the lungs are employed) and in front of the left bronchus, to enter the root of the left lung.

The pulmonary artery, as has already been noted, conveys "venous" or impure blood *from* the heart *to* the lungs, while the pulmonary veins convey "arterial" or purified blood *from* the lungs *to* the heart.

The *pulmonary veins* are four in number, two from each lung opening into the left auricle of the heart. The *upper right pulmonary vein* passes from the root of the right lung behind the superior vena cava, and the *lower right pulmonary vein* behind the right auricle, both to end at the upper and back part of the right margin of the left auricle. Both the *upper* and the *lower left pulmonary veins* pass from the root of the left lung in front of the descending aorta, to end at the upper and back part of the left border of the left auricle.

The **veins** of the systemic circulation take their origin at the termination of the capillaries, and they join one another to form larger and larger vessels as they proceed nearer the heart. In general the veins are either *superficial veins* which take origin from capillaries in the skin and subcutaneous tissue and lie in the superficial fascia, sometimes accompanying superficial arteries; or *deep veins*, which accompany arteries, in the case of the smaller arteries two veins usually accompanying one artery; or *visceral veins* which accompany the arteries to the different organs.

All the systemic veins terminate by forming three venous trunks which open into the right auricle of the heart, the *superior vena cava*, the *inferior vena cava*, and the *coronary sinus*.

The *superior vena cava* is formed, at the level of the first right costal cartilage, by the junction of the two *innominate veins*, and it descends, proceeding slightly towards the right, for about three inches until it opens into the upper and back part of the right auricle. It returns the blood to the heart from the head and neck, the upper limbs, the chest wall, and a small part of the abdominal wall at the back.

The *inferior vena cava* is formed, at the level of the fifth lumbar vertebra, by the junction of the two *common iliac veins*, and ascends through the abdomen on the right side of the vertebral column, passes through the diaphragm, and ends in the lower and back part of the right auricle. It returns the blood from both the lower limbs and from the walls and the contents of the abdomen and the pelvis.

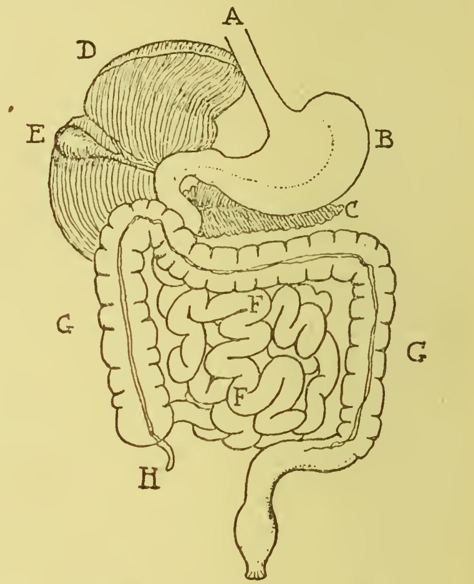
The *coronary sinus* is a short venous trunk, situated between the left auricle and the left ventricle in the auriculo-ventricular groove of the heart, and opening into the lower and back part of the right auricle. It is joined by practically all the veins of the heart walls, a few small veins opening directly into the heart chambers.

In addition to the systemic and the pulmonary veins there is another group of veins that forms the *postal system*, which is peculiar in both beginning and ending in capillaries. This system comprises the veins which convey the blood from almost the entire small and great intestines and from the spleen and the pancreas, to the liver; the smaller tributaries from these organs accompany, as usual, the corresponding arteries, but the larger trunks leave them, the *inferior mesenteric vein* joining the *splenic vein*, behind and to the left of the neck of the pancreas, at the level of the first lumbar vertebra, to form the *postal vein* which proceeds to the liver. The postal vein ascends in front of the inferior vena cava as far as the foramen of Winslow, then passing forwards behind the common bile-duct to the transverse fissure of the liver, where it divides into a right and a left branch. These branches pass into the liver substance to divide up eventually into minute capillaries around and within the liver lobules.

THE DIGESTIVE SYSTEM

The digestive system in man is composed essentially of a lengthy and complicated tube, at one end of which enters the food, from which nutriment is absorbed under the influence of various digestive fluids during its gradual progress through the tube, and undigested debris is ejected at the other end. It includes the *mouth* (which receives the secretion of the salivary glands), the *pharynx*, the *œsophagus*, the *stomach*, the *small intestine* (which receives the secretions of the *liver* and the *pancreas*), and the *large intestine*, which ends on the exterior and the *anus*.

The *mouth*, at which the digestive system commences, has as its chief function the mastication of the food, that is the breaking down and modification of the food so that it passes easily and in a form suitable for further digestion into the alimentary canal. The mouth is lined by mucous membrane, and it is bounded in front by the lips, which are movable muscular folds, formed chiefly by the orbicularis oris muscle, externally covered by skin and internally by the mucous membrane of the mouth, their free edges covered by a modified mucous membrane. The walls of the mouth, or the cheeks, are formed chiefly by the buccinator muscle, also in front by the orbicularis oris, behind by the masseter muscle, and by the other less important muscles inserted around the mouth; externally the cheeks are covered by the superficial fascia and skin, and internally by the mucous membrane of the mouth. The roof of the mouth is formed by the hard palate (composed of the palatine processes of the superior maxillary and palate bones) in front and the soft palate (composed of two layers of mucous membrane enclosing muscular and connective tissue) behind; below, the floor of the mouth is covered by mucous membrane, which stretches over the muscular diaphragm connecting the two sides of the body of the mandible; and behind, the mouth opens through the pillars of the fauces into the pharynx, the tonsils being placed between the anterior and posterior pillars of each side, and the uvula projects downwards from the back of the soft palate into the



DIGESTIVE SYSTEM.—*A*, œsophagus; *B*, stomach; *C*, pancreas; *D*, liver; *E*, gall bladder; *F*, small intestine; *G*, large intestine; *H*, appendix.

passage. The *tongue*, which is a fleshy tissue and covered with mucous membrane, projects upwards and forwards into the cavity of the mouth; its anterior part is free, while the posterior part, or root, is attached to the hyoid bone and the mandible. From above and below the dental arches of the superior maxilla and the mandible respectively project into the mouth. These arches are armed with the teeth, and they are covered with fibrous tissue which also surrounds the necks of the teeth, and, covered with mucous membrane, forms what are termed the gums. When the mouth is closed the cavity of the mouth proper is contained between the dental arches, while that outer part between the dental arches and the cheeks and lips is termed the vestibule. The teeth are modified for different purposes, the *incisors* and *canines* for biting the food and cutting it in pieces, and the *pre-molars* and *molars* for grinding it down so that it can be more easily swallowed. The teeth are more fully described in the section on the *Skeleton*.

Six *salivary glands*, arranged in three sets of pairs, pour their secretion into the mouth. The sublingual glands, almond shaped and about 1½ inches long, are placed at each side upon the floor of the mouth, the mylo-hyoid muscle being below, the body of the mandible on the outer side, the genio-glossus muscle on the inner side, and the mucous membrane of the floor of the mouth above. From these glands numerous small ducts open upon the floor of the mouth. The *submaxillary* glands are about the same size as the sublingual, and are placed inside and in front of the angle of the jaw at each side, the platysma muscle being below, the body of the mandible on the outer side, and the mylo-hyoid and hyoglossus muscles on the inner side, while the facial artery frequently passes through it. Its secretion reaches the mouth by *Wharton's duct*, which goes forwards below the floor of the mouth, on which it eventually opens beneath the tongue. The *parotid* glands, which are the largest of the salivary glands, are triangular in shape, and are situated at the sides of the head, in front of and below the ears. Each gland is placed between two layers of fascia in a recess between the sterno-mastoid muscle and the ramus of the jaw, extending in front over the masseter muscle, backwards to the anterior border of the sterno-mastoid muscle and the external auditory meatus of the ear, upwards to the zygomatic arch, downwards to the angle of the jaw, while the skin and superficial fascia, platysma muscle alone are superficial to the gland, and its posterior surface is in relation to the styloid process, the posterior belly of the digastric muscle, the carotid sheath, and further forward, to the masseter muscle.

The *pharynx*, or cavity of the throat, is about 5 inches in length, and lies beyond the mouth, separated from it by the soft palate and uvula above and somewhat in front, and the pillars of the fauces (which enclose the tonsils) on each side, and it extends upwards to the posterior part of the nasal cavity. Like the mouth, the pharynx is lined with smooth mucous membrane, while its walls are muscular, composed of the constrictor muscles of the pharynx. In the upper part of the pharynx, where it joins the nasal cavity, there is an opening in the side wall, bounded by a prominent cushion, which is the pharyngeal opening of the *Eustachian tube*, serving to convey air to the middle ear. During swallowing the upper part of the pharynx and the nasal cavity are shut off by the elevation of the soft palate. The *tonsils* are a pair of almond-shaped masses of lymphoid tissue, placed between the anterior and posterior pillars of the fauces at each side of the opening of the mouth into the pharynx. Below, the pharynx is continued as the *œsophagus* or *gullet*. The *trachea* (which conveys the air to the lungs) passes in front of the œsophagus and communicates with the pharynx by the *larynx*, the passage which contains the voice-organ; the opening is protected by the *epiglottis*, a little lid which projects backwards into the pharynx and closes down over the entrance of the larynx during the act of swallowing.

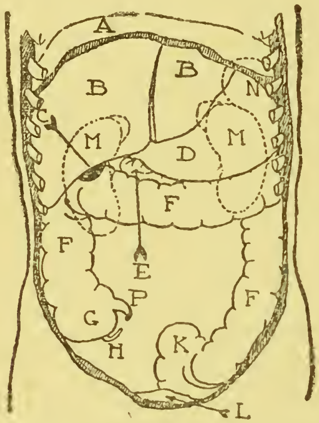
The *œsophagus* or *gullet* is a narrow tube, about 10 inches in length, which connects the pharynx with the stomach. It has strong muscular walls, composed of an outer layer of longitudinal and an inner layer of circular muscle fibres, and is lined with mucous membrane which secretes viscid mucous and is thrown into longitudinal folds. The œsophagus is situated in the neck, between the trachea in front and the vertebral column behind, with the carotid sheaths at each side; and, in the thorax, it is still placed behind the trachea and in front of the vertebral column as far down as the bifurcation of the trachea, thereafter lying with the aorta first on its left side and, lower down, behind, while it is in relation to the pleura at the sides and the pericardium in front. Eventually it passes through the diaphragm and joins the stomach.

The *stomach* is the most dilated part of the digestive system, and is the receptacle for the food after it has been masticated and swallowed. Its shape naturally alters with the degree of its distension, but when moderately distended it is pear-shaped, curved upon itself, and it is situated on the left side, at the back of the upper part of the abdomen, just below the diaphragm, which is between it and the heart and left lung. The bed in which the stomach lies is formed below by the transverse meso-colon, which is a fold of peritoneum directed forwards above the small intestine to the transverse colon; behind, by the upper surface of the pancreas, a large area of the anterior surface of the spleen, the upper part of the anterior surface of the left kidney and the suprarenal capsule; on the inner side by left lobe of liver; and in front by the ribs and abdominal wall.

The rounded, more dilated upper end of the stomach, which is joined by the œsophagus, is termed the *cardiac end*, or *fundus*, while the more cylindrical lower end, which joins the small intestine, is termed the *pyloric end*.

The walls of the stomach have an outer *serous* coat or peritoneum, a *muscular* coat, a *submucous* coat, and a *mucous* internal lining. The muscular coat has an outer layer of longitudinal muscle fibres, a middle layer of circular muscle fibres (which are less complete towards the cardiac end), and an inner layer of oblique muscle fibres (which disappear towards the pyloric end). The submucous coat, between the muscular coat and the internal mucous membrane, has a great number of little blood-vessels running through it to supply both the stomach generally and its numerous glands with nourishment. The lining mucous membrane of the stomach is soft and thrown into numerous folds, while it is pitted with the openings of the great number of minute gastric glands. The farther or pyloric end of the stomach is marked by a thickening of the wall due to a development of the circular muscle fibres forming a sphincter, or valve.

The *small intestine* is that part of the alimentary canal between the stomach and the large intestine, and, about 20 feet in length, its coils occupy the greater part of the abdominal cavity. It is considered in three parts, the upper or *duodenum*, the middle or *jejunum*, and the lower or *ileum*. The walls of the small intestine have, like the stomach, a *serous* outside covering of peritoneum, to a greater or less extent in different parts of the intestine, a *muscular* coat, composed of an outer longitudinal layer and an inner circular layer of muscular fibres, or *submucous* coat of areolar tissue, and a lining coat of *mucous membrane*. The lining mucous membrane is thrown into permanent folds in the form of crescents or complete rings going transversely round the interior, termed *valvulæ conniventes*, and their purpose is to increase the absorbing and secreting surface of the mucous membrane. These valvulæ are not, however, present in the upper part of the duodenum, while in the ileum they become less prominent, and are absent altogether from about the middle of that section of the intestine. The surface of the mucous membrane is closely pitted with the openings of great numbers of minute tubular glands, the *glands of Lieberkühn*, which secrete a digestive fluid. Over the whole of the internal surface, also on the valvulæ and between them, are minute projections called *villi*, present in enormous numbers, but becoming less in size and number lower down in the intestine, their function being to absorb the digested food or *chyle*. Scattered over the surface are little follicles, formed of



Abdomen, with Front Abdominal Wall (including the Ribs) and the Small Intestines removed.—*A*, diaphragm; *B*, liver; *C*, gall-bladder; *D*, stomach; *E*, pancreas; *F*, *F*, *F*, large intestine; *G*, cæcum; *H* appendix; *K*, rectum; *L*, bladder; *M*, *M*, kidneys (behind); *N*, spleen (behind); *P*, junction of small with large intestine.

lymphoid tissue, termed *solitary glands*, which, however, is a misleading term, as they are not glandular at all, their functions being probably connected with the blood. These solitary glands are here and there aggregated together, forming larger patches of lymphoid tissue called *Peyer's patches*. Both the solitary glands and the Peyer's patches are found in greater abundance in the lower part of the intestine.

The *duodenum* begins at the pyloric end of the stomach, and is about 11 inches in length, curved in the form of the letter C, and fixed to the posterior wall of the abdomen. The first part goes outwards and backwards from the pylorus, below the liver and above the head and neck of the pancreas to the neck of the gall-bladder; the second part, into which the ducts of the liver and pancreas open, is then directed downwards behind the transverse colon and in front of the inner side of the right kidney, between the liver on its outer side and the head of the pancreas on its inner; the third part proceeds inwards and upwards in front of the vena cava and behind the superior mesenteric vessels, in close relation to the head of the pancreas above.

The *jejunum*, the upper part of the small intestine beyond the duodenum, is about 7 or 8 feet in length, and is held in position in the abdominal cavity by a large fold of peritoneum, the *mesentery*, attached to the posterior wall of the abdomen.

The *ileum*, the lower part of the intestine beyond the jejunum, is about 10 to 12 feet in length, and, like the jejunum, is held in position in the abdominal cavity by the mesentery. It opens into the large intestine rather over two inches from the end, its opening being protected by a valve.

The *liver* is the largest gland in the body, and is a large vascular mass of a reddish-brown colour situated in the upper right part of the abdominal cavity, dome-shaped but of irregular form, and about three pounds in weight. It may be best described as having two surfaces, the *parietal* surface facing upwards, forwards, and outwards to the right, and the visceral surface facing downwards, backwards, and inwards to the left, while the two surfaces are separated by a sharp *inferior margin*. The *parietal surface* is in close relation, alike above, in front, and at the right side, to the under surface of the diaphragm, the rounded arch of which gives the liver its dome-shaped appearance. In front, however, a small part of the anterior aspect of the parietal surface projects beyond the limit of the diaphragm and the ribs, and is in direct relation with the anterior abdominal wall.

The *visceral surface* is divided into a right and a left lobe by a deep longitudinal fissure, and it is moulded by the viscera upon which it lies. The *left lobe* has concave impressions made upon it by the stomach and œsophagus, and has a rounded tuberosity which is in relation to the fold of peritoneum (gastro-hepatic omentum) stretching between the stomach and the liver. At the posterior margin of this lobe there is placed vertically, a rounded, oblong, projecting mass of liver substance, marked out by deep fissures all around, termed the *spigelian lobe*, in relation to the œsophagus on the left, the vena cava (which makes a deep impression in the liver substance) on the right, and the posterior abdominal wall behind.

Extending horizontally from the middle of the longitudinal fissure to the centre of the surface of the *right lobe* is the *transverse fissure*, a deep fissure in the liver substance by which the portal vein, hepatic artery, and hepatic ducts enter the liver. From the outer end of the transverse fissure to the anterior margin of the surface extends obliquely the pear-shaped *gall-bladder*, bound down to the visceral surface by the peritoneum, its duct, the *cystic duct*, joining the hepatic duct at the mouth of the transverse fissure to form the *common bile duct*. Immediately behind the transverse fissure is a neck of liver substance termed the *sandate lobe* joining the spigelian lobe to the right lobe of the liver. In front of the transverse fissure, bounded on the left by the longitudinal fissure and on the right by the gall-bladder, is an area termed the *quadrate lobe*, which is in relation to the first part of the duodenum. The large area of the right lobe on the outer side of the gall-bladder has upon it a deep concave impression made by the right kidney, and lesser impressions in front of that made by the beginning of the second part of the duodenum and by the colon.

The *inferior margin*, which separates the parietal from the visceral surface, corresponds with a line drawn on the surface of the body from a point about an inch below and internal to the left nipple to a point midway between the gladiolus and the umbilicus, then obliquely to a point about half an inch below the tip of the tenth costal cartilage; the inferior margin then proceeds backwards in a line above the upper margin of the eleventh rib and, proceeding upwards, is thereafter indistinctly marked. In front, slightly to the right of the middle line of the body, there is a distinct notch in the inferior margin, where the longitudinal fissure of the visceral surface meets it, and here the falciform ligament, joining the liver to the anterior abdominal wall somewhat above the umbilicus, is attached, the attachment proceeding also upwards over the parietal surface. The falciform ligament is the remains in the adult of the umbilical vein of the fœtus. At a point which may be marked as between the ninth costal cartilage and the outer margin of the rectus abdominus muscle the fundus of the gall-bladder projects beyond the inferior margin of the liver and comes into direct contact with the anterior abdominal wall.

In regard to its *minute structure*, the liver is composed of a great number of minute lobules (about $\frac{1}{17}$th of an inch in diameter) of characteristic polygonal liver cells, each lobule being bounded by slight connective tissue. Interlobular branches of the portal vein run in this connective tissue at the margins of the lobules and break up into minute capillary branches which run towards the centre of each lobule to a central intralobular vein. This central vein joins similar veins to become the hepatic vein and eventually enters the vena cava. At the margins of the lobules also run the minute bile-ducts which are joined by fine bile capillaries from between the liver cells of the lobules, and thus collect the bile secreted by the cells. These bile-ducts join together to form the hepatic duct, by which the bile is poured into the duodenum.

The *functions* of the liver include, in addition to the secretion of bile, which is a digestive fluid acting upon fats and making them more easily absorbed, the breaking down of worn-out blood-corpuscles, which are then excreted in the bile; while the liver is also a great storehouse of nutriment for the body, carbohydrates and proteids absorbed after a meal in a soluble form by the blood being held up in the liver-cells in the form of *glycogen*, which is set loose when the body requires it.

The *pancreas* is a long gland, of whitish colour, situated in the upper part of the posterior abdominal wall, shaped like the letter J, about 6 or 7 inches in length and about 3½ ounces in weight. It may be described as having a head, a neck, a body, and a tail. The *head* lies within the curve of the duodenum, with which it is in close relation, particularly above and on the right side, the superior mesenteric passing from beneath the neck of the pancreas, in relation to its left side; in front the transverse colon is in contact, while behind it lies upon the vena cava and the aorta. The *neck* is the narrow part of the pancreas between the head and body; above and in front of it is the duodenum, the superior mesenteric vessels pass beneath it, and it lies upon the beginning of the portal vein. The *body* presents an upper surface which forms part of the bed of the stomach, a lower surface which is covered by peritoneum and is in contact with the jejunum and the colon, and a posterior surface, in relation to the posterior abdominal wall, crossing the aorta, the left supra-renal capsule, and the left kidney. The *tail* of the pancreas is the narrow terminal portion, in contact with part of the anterior surface of the spleen. The pancreas is composed of tubules lined with polyhedral cells, containing granules in their inner two-thirds, while the outer third, where the nucleus is situated, is free from granules. The tubules open into larger collecting ducts, which end in their turn in the main pancreatic duct, opening into the duodenum along with the common bile-duct, and the accessory pancreatic duct, opening into the duodenum a short distance above the other. The pancreas secretes a digestive juice which has a digestive action on all three kinds of foodstuffs, fats, carbohydrates, and proteins.

After passing through the small intestine, the food, mixed as it is with digestive juices, passes into the *large intestine* through the ilio-cæcal valve, which consists of two segments, each composed of a double layer of mucous membrane with muscular fibres and connective tissue between, to prevent its regurgitation. The walls of the large intestine have the same structure as those of the small intestine, except that the longitudinal muscle fibres are divided into three bands, or *tænia coli*, which are about a ¼ inch wide and arise from the appendix and proceed, one on the front, one on the back, and one on the internal side of the intestine, as far as the rectum, where they form a continuous layer. The large intestine is thrown into sacculations, while on the outer aspect little pouches termed *appendices epiploicæ*, of peritoneum filled with fat, project from it. The internal surface is smooth and lined with mucous membrane, with the openings of numerous Lieberkühn's glands on the surface, and villi are absent, while the so-called solitary glands are present in considerable numbers.

The large intestine is best considered under several divisions: the *cæcum*, the saccular dilatation and widest part of the intestine beyond the ilio-cæcal valve, into the end of which opens the narrow blind tube called the *vermiform appendix;* the *ascending colon*, going upwards on the left side of the abdominal cavity as far as the liver; the *transverse colon*, extending right across the front of the upper part of the abdominal cavity; the *descending colon*, going vertically downwards on the left side; the *iliac colon*, a short portion curving into the pelvis; the *pelvic colon*, a long loop of intestine in the pelvis, and lastly the *rectum*, which is a dilated part just above the opening of the alimentary canal upon the surface. The *anus*, which is the part actually opening on the surface, is usually kept tightly closed by strong circular muscular fibres which surround it.

The *abdominal cavity*, in which the greater part of the digestive system is situated, is lined by a glistening serous membrane, the *peritoneum*, consisting of two communicating sacs, the greater and the lesser. The greater sac lines most of the abdominal cavity and covers most of the organs contained within it, while the smaller sac is placed behind the greater, mainly between the posterior wall of the stomach and the posterior abdominal wall, and it opens into the greater sac by the *foramen of Winslow,* which is situated immediately below the caudate lobe of the liver. The front wall of the stomach is covered by the peritoneum of the greater sac and the posterior wall of the lesser sac; and from the lower border or greater curvature of the stomach hangs down over the coils of small intestine a peritoneal apron, the greater omentum, formed of a double layer of peritoneum, the anterior layer derived from the greater sac and the posterior from the lesser sac. The lower border of the omentum is reflected back on to the transverse colon, which it encloses within its layers, and thence it passes as the transverse meso-colon to the posterior abdominal wall, where the layer of the lesser sac passes upwards and the layer of the greater sac downwards. Extending obliquely across the posterior abdominal wall a fold of peritoneum of the greater sac takes origin which proceeds forwards as a double layer to enclose and hold in place the small intestine. This important fold is called the *mesentery.*

The great intestine is not completely invested with peritoneum in all its different parts; round the cæcum and vermiform appendix the investment is complete and those parts are attached to the posterior abdominal wall by special folds of peritoneum; the ascending colon has its front and sides only covered with peritoneum, the back being in contact with the posterior abdominal wall; the transverse colon, as has been observed, is enclosed with two layers of peritoneum and attached to the posterior abdominal wall by the meso-colon; the descending colon has the same peritoneal relations as the ascending colon, as has the iliac colon; the pelvic colon is completely invested with peritoneum, being attached to the pelvic wall by a special peritoneal fold; while the upper part of the rectum is covered with peritoneum in front and usually at the sides, while the lower part has no peritoneal covering, the peritoneum being reflected forwards on to the upper surface of the urinary bladder in the female, and thence to the anterior abdominal wall.

When the food is taken into the mouth it is broken into small pieces by the process of mastication and at the same time mixed with the alkaline saliva from the salivary glands. The saliva serves to moisten the food and make it more easily swallowed, and also, by virtue of an enzyme, *ptyalin,* which it contains, it transforms a small part of the carbohydrate of the food into dextrine or maltose.

After being thoroughly masticated the food is gathered on the surface of the tongue, which pushes it backwards to be seized by the muscular walls of the pharynx, and then it is quickly propelled through the pharynx and the œsophagus down to the stomach.

The upper and more dilated part of the stomach, or the fundus, acts as a reservoir for the food, which is gradually passed along to the more cylindrical pyloric end. Digestion by the saliva goes on for some time in the stomach, but eventually the gastric juice, which has been secreted by the stomach glands in response to the stimulus of the presence of food and alkaline saliva, is sufficient to neutralise and render acid the stomach contents, thus stopping the action of ptyalin. The gastric juice converts most of the protein of the food into syntonin, albumoses, or peptones, while the fat becomes free. *Pepsin* is the enzyme in the gastric juice which causes the conversion of the protein, and *free hydrochloric acid,* which is necessary for the action of pepsin and in addition prevents decomposition of the stomach contents, is also produced in the stomach. The pyloric part of the stomach undergoes violent and rhythmic contractions so as to mix the food thoroughly with the digestive juices, and also to squirt it gradually through the pyloric valve to the small intestine. Absorption of the food takes place to a small extent in the stomach.

As the *chyme,* as the partly digested food in the stomach is termed, comes into the duodenum it is in contact with the mucous membrane and converts the *pro-secretin* of its cells into *secretin.* This is absorbed by the blood-capillaries and conveyed to the pancreas and liver, exciting a flow of pancreatic juice and of bile. The alkaline pancreatic juice neutralises the acid chyme, and as soon as the neutralisation is complete more chyme comes from the stomach through the pyloric valve. The pancreatic juice also stimulates a flow of the intestinal digestive juice, *succus entericus,* secreted by Lieberkühn's glands, which contains several enzymes acting on the derivatives of protein and the carbohydrates in the food, and converting them into still simpler substances.

The pancreatic juice contains an enzyme, *trypsin,* which causes a still further breaking down of the proteins, and also other enzymes which act on the carbohydrates and fats. Bile, the secretion of the liver, is a solvent of the fats and fatty acids in the food.

It is in the small intestine that the food is mainly absorbed, the villi being the absorbent agents; fats (which are absorbed in the form of fatty acids and glycerine) are conveyed away by the lacteal vessels of the villi to the central lymphatic system and ultimately the blood-stream; while proteins (absorbed in the form of amino-acids or in some cases simply as albumoses and peptones) and carbohydrates (absorbed as simple sugars) are conveyed away by the blood capillaries of the villi.

In the large intestine, to which the food next passes, digestion and absorption of nutritive substances both go on to a slight extent, the digestion being probably caused by enzymes which have been carried down in the food from the small intestine. Absorption of water, however, takes place to a very considerable extent in the large intestine, and the undigested material which passes down to the rectum becomes gradually more and more solid in consistence.

In addition to the undigested debris excreted by the intestines, waste products are excreted by the kidneys, the skin, and the lungs; the urine and the sweat contain waste products derived from proteins, while the carbon dioxide excreted through the lungs is a waste product of the carbohydrates and fats, and superfluous water is excreted in the urine, in the perspiration, and also by the lungs.

THE LYMPHATIC SYSTEM

As the walls of the vessels in which it flows prevent the blood from coming ever in intimate contact with the cells of the tissues, even when it passes through the smallest capillaries there is a layer of endothelial cells intervening, it is necessary that some intermediary agent should exist with the function of conveying the nourishment from the blood directly to the cells of the tissues. This function is carried out by the fluid called *lymph.*

The lymph is a colourless, watery fluid, alkaline, but less so than blood plasma, and coagulable, but clotting less firmly than blood plasma. It contains white corpuscular elements, *lymphocytes,* which are derived mainly from the lymph glands, and, after a meal, the lymph coming from the intestines contains fat globules and dissolved nutritive substances from the digested food, giving it a milky appearance.

This exudes from the blood through the capillary walls in the various tissues and organs, and, after laving and nourishing the cells of the tissues it is taken up by the lymphatic vessels, carrying with it any waste products of the tissues, and is eventually poured into the great veins of the neck by the two main lymphatic vessels, the *thoracic duct* and the *right lymphatic duct.*

The flow of lymph from the tissues depends partly on the amount of the tissue fluids and partly upon the power of the cells lining the lymph capillaries to determine the amount of lymph entering the capillaries, a power which is influenced by the activity of the tissues.

The *lymph capillaries* lie in the intercellular spaces of the tissues and receive the lymph after it has exuded from the blood capillaries and laved the tissue cells; they are lined by a layer of *endothelial* cells and are in direct communication with the *lymph spaces.* Some of the lymph spaces are merely spaces in the connective tissue with no special lining; others, such as the *capsule of Tenon* in the orbit or the *sub-epicranial space* in the scalp, are lined with endothelium, while others are larger and more important serous cavities, such as the *pleural* and the *peritoneal cavities.*

The lymph capillaries join together to form the *lymphatic vessels,* which have an inner lining of endothelial cells, and an outer coat of fibrous tissue, with, in the larger vessels, also a middle coat of muscular tissue, and they are furnished with valves so that the lymph can flow only in the direction of the thoracic duct and the great veins. The *lacteals* are those lymphatic vessels which convey the chyle, or digested food, from the intestine, and they converge to join the sac termed the *receptaculum chyli,* to which go also all the abdominal lymphatics.

The main lymph vessels are the thoracic duct and the right lymphatic duct. The *thoracic duct,* which is the more important, being about 16 or 18 inches long, commences as a dilated sac, the *receptaculum chyli,* which is situated in the upper part of the posterior abdominal wall, under the right crus of the diaphragm, between the right side of the aorta and the vena azygos major, at the level of the first two lumbar vertebræ. The two main lumbar lymphatic vessels, from the right side and from the left, join the lower end of the sac, the main lymphatic trunk from the intestine joins it about the middle, and the two main thoracic lymphatic vessels, from the right side and the left, join its upper part. The thoracic duct proceeds upwards from the upper end of the receptaculum chyli, passes through the aortic opening of the diaphragm on the right side of the aorta, and enters the thorax. It proceeds between the right side of the aorta and the vena azygos major as high as the level of the fifth thoracic vertebra, and then it suddenly crosses behind the aorta and in front of the vertebral column, continuing its course upwards at the left side of the vertebral column to the root of the neck, where it arches over the apex of the lung and the left subclavian artery and opens into the junction of the left internal jugular and subclavian veins.

The *right lymphatic duct* is a much shorter and less important vessel, being rather less than an inch in length. It is formed by the junction of the main lymphatic vessels from the right arm, right side of the head and neck, and right side of the chest, and it opens into the right innominate veins.

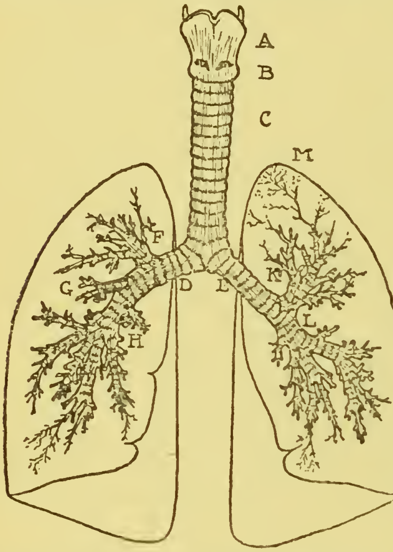
Lymphatic glands are usually irregularly oval bodies in shape, situated generally in the neighbourhood of the great blood-vessels or in the subcutaneous tissue. A lymphatic gland has a capsule of fibrous tissue from which fibrous bands go into the substance of the gland, a fibrous network being thus formed, the meshes of which are filled by lymphoid tissue. In the gland substance are sinuses through which the lymph stream flows. The glands are placed in different positions in the courses of the lymphatic vessels, and act as filters, while from their cells are to a large extent derived the white corpuscles of the lymph and of the blood.

The more important sets of lymphatic glands in the body may be noted. The lymphatic glands of the *neck:* submaxillary (below the lower jaw), superficial cervical (along the course of the external jugular vein), deep cervical (along the course of the internal jugular vein). The lymphatic glands of the *upper limb:* supra-trochlear (above the internal condyle at the elbow), axillary (along the vessels in the axilla), infra-clavicular (immediately below the clavicle). The lymphatic glands of the *lower limb:* inguinal, femoral, and pubic (all in the region of the groin), deep femoral (along the course of the femoral vein), popliteal (in the space behind the knee). The lymphatic glands of the *thorax:* intercostal (in intercostal spaces close to the vertebral column), diaphragmatic (on upper surface of the diaphragm), bronchial (along the sides of the bronchi), superior mediastinal (on the arch of the aorta, in front of the trachea, along the innominate veins), posterior mediastinal (along the descending aorta and the œsophagus). The lymphatic glands of the *abdomen:* gastric (along the borders of the stomach), hepatic (in the peritoneal fold below the transverse fissure of the liver), pancreatic (along the upper border of the pancreas), mesenteric (over a hundred scattered in the mesentery), cœliac (in front of the aorta round the cœliac axis), splenic (at the hilus of the spleen), common iliac (along the course of the common iliac arteries), external iliac (along the course of the external iliac arteries), internal iliac (in front of the internal iliac arteries), sacral (in the hollow of the sacrum), lateral lumbar (at the sides of the lumbar region of the vertebral column), median lumbar (along the sides of the aorta and vena cava), sub-aortic (below the bifurcation of the aorta).

THE RESPIRATORY SYSTEM

The respiratory system includes the *larynx*, the *trachea*, the two *bronchi*, and the two *lungs*. The larynx opens into the lower part of the pharynx and the nasal passages, or the mouth, when it is open, before entering or after leaving the respiratory passages proper.

The *larynx*, or upper part of the respiratory passage, is adapted for the special function of voice production. It lies in the front of the neck, causing a more or less marked projection, below



RESPIRATORY SYSTEM.—*A*, thyroid cartilage; *B*, cricoid cartilage; *C*, trachea or windpipe; *D*, right bronchus, leading to right lung; *E*, left bronchus, leading to left lung; *F*, main branch to upper lobe of right lung; *G*, main branch to middle lobe of right lung; *H*, main branch to lower lobe of right lung; *K*, main branch to upper lobe of left lung; *L*, main branch to lower lobe of left lung; *M*, terminal branches of bronchi ending in the air-cells.

the hyoid bone and the root of the tongue, and between the great blood-vessels at each side of the neck. It is superficially placed, being covered by the skin, superficial and deep fascia, the infra-hyoid muscles, and slightly overlapped at the sides by the sterno-mastoid muscles and the lobes of the thyroid gland. It is composed of a framework of several cartilages, joined together by various membranes and ligaments, and to them a number of little muscles are attached, while the interior is lined with mucous membrane.

The largest of the cartilaginous plates is termed the *thyroid cartilage;* it is composed of two wings which meet in front at an angle, except in the upper part, where they are separated by a deep notch, the apex of which projects in the neck and is popularly known as the Adam's apple. The upper and lower borders of the wings are prolonged upwards and downwards into slender processes or cornua, the upper cornua being attached to the hyoid bone and the lower to the cricoid cartilage. The spaces between the thyroid cartilage and the hyoid bone above and the cricoid cartilage below are filled by membranes termed respectively the thyro-hyoid and the crico-thyroid membranes. On the outer surface of each wing is an oblique ridge to which are attached the sterno-thyroid and thyro-hyoid muscles.

The *cricoid cartilage* is a complete ring, broader and thicker behind, placed immediately below the thyroid cartilage, to which it is attached by ligaments joining the inferior cornua of the thyroid cartilage, and, in front, by the crico-thyroid membrane mentioned above.

The *arytenoid cartilages*, two in number, are placed on the posterior part of the upper border of the cricoid cartilage; they are pyramidal in shape, the base being concave from before backwards to hold its place on the border of the cricoid cartilage, while the apex points inwards and backwards. The arytenoid cartilages are extremely mobile.

The two *cartilages of Santorini* are minute nodules of cartilage placed on the apices of the arytenoid cartilages, and so prolonging inwards the tips of the cartilages.

The two *cartilages of Wrisberg*, which are not always present, are two minute nodules of cartilage situated in the middle of the free borders of the aryteno-epiglottidean folds of mucous membrane.

The *epiglottis* is a thin plate composed of fibro-cartilage which projects from the front of the larynx over the opening of the air passage into the pharynx. It has a free edge above, where it is broadest, and gradually narrows to a slender apex which is attached to the inner side of the lower part of the thyroid cartilage. To its edge are attached the aryteno-epiglottidean folds of mucous membrane, while the epiglottis is also attached by ligaments to the thyroid bone and the root of the tongue.

The muscles of the larynx consist of four pairs and one single muscle. The latter is the *arytenoideus*, composed of a superficial or oblique part and a deep or transverse part; the former consists of two slips which arise from the bases of the arytenoid cartilages, and, crossing each other, are inserted on the sides of the epiglottis; the latter crosses from the posterior surface of one arytenoid cartilage to the other. The *crico-thyroid* muscle arises from the lower edge of the front of the cricoid cartilage and is inserted as two distinct slips along the lower border of the wing of the thyroid cartilage. The *posterior crico-arytenoid* muscle arises from the back of the cricoid cartilage and passes outwards to be inserted on the base of the arytenoid cartilage. The *lateral crico-arytenoid* muscle is a small slip arising from the upper border of the back of the cricoid cartilage and, passing upwards, is inserted on the base of the arytenoid cartilage. The *thyro-arytenoid* is a broader muscle which arises from the lower part of the inner surface of the wing of the thyroid cartilage, and, passing backwards, divides into two slips, the lower of which is inserted on the arytenoid cartilage, while the upper is inserted into the edge of the epiglottis.

The interior of the larynx is lined by mucous membrane. The sides of its upper opening are formed by two sharp folds of mucous membrane which stretch between the epiglottis and the arytenoid cartilages, termed the *aryteno-epiglottidean folds.* Between these folds and the sides of the passage there is, at each side, a pocket termed the *pyriform sinus,* in which foreign bodies which enter the pharynx often lodge. The back of the opening of the larynx is formed by the projecting epiglottis. The larynx itself is divided into three parts on each side by two pairs of folds of mucous membrane. The upper part is wider than the opening above and narrows at the first pair of mucous membrane folds, the *false vocal cords.* The middle part consists of a narrow pocket between the upper and lower mucous membrane folds, and is termed the *laryngeal sinus.* The lower pair of mucous membrane folds are prominent and sharp, being the *true vocal cords,* composed of mucous membrane tightly stretched over underlying ligaments on each side, between the thyroid and arytenoid cartilages. The lower part of the larynx, below the true vocal cords, leads directly into the trachea.

The voice is produced by the expulsion of air through the narrow passage between the true vocal cords, which, being elastic and tightly stretched, are set in vibration by the air-current and then transmit their vibrations to the air above, setting up air-waves. While, during ordinary respiration, the opening between the vocal cords is about half open, for voice production the vocal cords are brought very closely together, while the pitch of the sound depends on their tenseness. The narrowing of the opening is effected by the action of the *lateral crico-arytenoid* muscles and to a less extent the *thyro-arytenoid* and *arytenoid* muscles. The vocal cords are rendered more tense by the contraction of the *crico-thyroid* muscles.

Speech is produced by the action of the tongue in the mouth and pharynx and does not depend on the larynx ; if the larynx is not brought into action whispering is, however, only produced, and for ordinary speech the larynx must at the same time act in producing voice. The *trachea* is the tube which conveys the air from the larynx to the bronchi, and it is rather over four inches in length, the upper inch being situated in the back, and the remaining part in the thorax, while it ends opposite the fifth thoracic vertebra by dividing into the left and right bronchi. The trachea is composed of a fibro-elastic membrane, in which are horseshoe-shaped plates of cartilage, some twenty in number, which serve to keep the air passage permanently open. The back of the trachea, where the cartilages are deficient, is closed by non-striped muscle in front of the fibro-elastic tissue, and by contracting, it can alter the diameter of the tube. The interior of the trachea is lined with mucous membrane, the epithelial cells of which are provided with cilia which assist the movement upwards of the mucus on the surface.

Immediately below the larynx the trachea is crossed by the isthmus of the thyroid gland, the lobes of which are closely applied to its sides. At each side of the trachea in the neck is the common carotid artery, and at its lower part, at the left side, the arch of the aorta is in close relation, as are the great vessels which spring from the aortic arch, the innominate and the left common carotid being at first in front of the trachea. In close contact with the whole length of the posterior aspect of the trachea is the œsophagus, which separates the trachea from the bodies of the vertebræ.

The *bronchi,* into which the trachea divides opposite the fifth thoracic veretebra, are two in number, the right being rather wider, shorter, and at a less acute angle than the left. The structure of the bronchi resembles that of the trachea, rings of cartilage likewise deficient behind and closed by unstriped muscle, similarly keeping the tubes permanently open. The bronchi branch freely on all sides in the substance of the lungs, the smaller branches sending off still smaller branches, and as the air passages become smaller the cartilages gradually disappear, and the muscle fibres form a layer all round the passages. The left pulmonary artery passes above all the branches of the left bronchus, but on the other side the first branch of the right bronchus passes above the right pulmonary artery and is termed the *eparterial bronchus,* all the other branches passing below.

The *lungs* are two in number, and are conical, spongy, vascular organs, situated one on each side of the thorax. Each is invested with a serous membrane, the *pleura,* which is continuous at the root of the lungs with a similar membrane which lines the cavity of the chest, the space between the two membranes (which is practically non-existent as the membranes are in close contact separated only by a slight film of serous fluid), being termed the pleural cavity. The line along which the pleura leaves the chest wall to pass on to the lung is termed the line of pleural reflection. On the *right side* it may be indicated on the surface by a line drawn from about an inch above the inner third of the clavicle, over the sterno-clavicular articulation obliquely to the centre of the manubrium sterni, where it meets that of the other side, and then vertically down to the level of the sixth costal cartilage. The line then passes obliquely downwards and outwards over the seventh costal cartilage to the junction of the eighth rib and the eighth costal cartilage ; it crosses the tenth rib in the mid-axillary line, crosses the eleventh rib in a line drawn vertically from the angle of the scapula, crosses the middle of the twelfth rib at the outer border of the erector spinæ muscle, and reaches the vertebral column at the level of the body of the twelfth vertebra. The posterior line of reflection follows the outer margin of the vertebral column.

On the *left side* the line of pleural reflection corresponds to that of the right side as far as the fourth costal cartilage, where it passes outwards and then descends just outside the outer margin of the sternum to the sixth costal cartilage, afterwards following approximately the same direction as the line of the opposite side, but slightly higher than it.

The surface marking of the right lung is practically the same as the line of pleural reflection as far as the sixth costal cartilage, although it does not quite meet that of the opposite in the sternal region, but thereafter the line passes much less obliquely outwards at the level of the sixth rib, crosses the eighth rib in the mid-axillary line, the tenth rib in the scapular line, and reaches the vertebral column at the lower border of the tenth vertebra. Posteriorly it is practically the same as the line of pleural reflection.

The surface marking of the *left lung* corresponds to that of the right as far as the fourth costal cartilage, when it passes outwards along the lower border of the cartilage to a point about 1½ inches from the margin of the sternum ; it then is directed obliquely downwards to the fifth costal cartilage, and turns inwards to the upper border of the sixth costal cartilage, thus forming a larger notch ; thereafter it follows the same direction as on the other side.

The lungs are moulded to the walls of the chambers in which they are situated, the outer aspects receiving the impressions of the ribs, while the under aspects are hollowed by the diaphragm ; the right lung, in its inner aspect, is moulded by the heart, which causes a slight depression in front, the innominate vein and artery, the vena agygos major, and other neighbouring structures; the left lung in its inner aspect has a deep depression in front moulded by the heart, the bulk of which is, of course, on the left side; a prominent groove is caused by the aorta, while the left subclavian artery, the left innominate vein, and other structures, form impressions.

Each lung has in its substance a deep fissure, which, starting about two inches below the apex, runs obliquely downwards and forwards to the base. The right lung has also a secondary fissure running horizontally from the middle of the greater fissure to the inner border of the lung ; thus the left lung is divided into two and the right into three lobes.

Each lung is attached on its inner aspect to the mediastinal wall of the pleural cavity, at the root, where the blood-vessels (pulmonary arteries and veins), bronchi, lymphatics, and nerves enter and leave its substance. The terminal branches of the bronchi end in irregular passages, from the sides of which go off the *air-sacs* or *alveoli*, which have delicate membranous walls containing a fine network of capillaries. The blood in these capillaries is thus only separated from the air in the alveoli by the light framework of the walls of the capillaries and the alveoli, being spread by the capillary network over a comparatively large surface, and it is here that the interchange of gases between the air and the blood takes place. The process of breathing consists in enlarging the chest by raising the ribs to a more horizontal plane and depressing the diaphragm so as to inspire air into the lungs, the former being the more important factor in women and the latter in men. The movements of the ribs in inspiration are produced by muscles attached from the ribs to the skull, vertebral column, and scapulæ, including the levatoses costarium, scaleri, sternomastoid, serratus, posticus superior, cervicalis ascendens, pectoralis major, while the external intercostal muscles are also concerned. The diaphragm is depressed by the longitudinal curves being straightened through the contraction of the muscular fibres, the central tendon moving but slightly in respiration. In expiration the ribs and diaphragm regain their position of rest, and, except the internal intercostal muscles, no special expiratory muscles are called into play in ordinary expiration. In forced expiratory effort, however, the muscles of the abdominal walls force up the diaphragm and pull down the ribs and sternum, assisted by the triangularis sterni, which is attached to the costal cartilages and sternum, the serratus posticus inferior, attached to the lumbar fascia and the lower ribs, and the quadratus lumborum, attached from the pelvis to the last rib.

The chest acts practically like a bag, which, when it is enlarged, draws in air, and when it is collapsed, drives it out again. The movements of the chest change the air only in the trachea and the larger bronchi, the air-sacs or alveoli not being affected to any extent by the movements, and the air which they contain is reserved by diffusion of gases; since the air in them is not changed, as in the larger passages, it is always poorer in oxygen and contains a greater quantity of carbon dioxide then the outside air.

The amount of air which is taken in and passes out at an ordinary respiration is about 20 to 30 cubic inches, this being termed the *tidal air ;* the *complemental air,* or the amount that can be inspired beyond this by a forced inspiration, is about 100 to 120 cubic inches; the *supplemental air,* or the amount that can be forcibly expelled from the chest after an ordinary expiration, is about 100 cubic inches ; while the *residual air,* or the amount that remains in the lungs after the most complete effort of expiration, is about 100 to 120 cubic inches.

The oxygen is held in the blood in chemical combination with the hæmoglobin of the red corpuscles, and is carried in this way from the lungs to the heart, and thence by the arteries and capillaries to the various tissues of the body, where it breaks away from the hæmoglobin and is absorbed. Carbon dioxide, on the other hand, is given off by the tissues and is dissolved in the blood plasma and combined with the sodium carbonate in it, forming sodium bicarbonate ; this is conveyed by the veins to the lungs, where it is given off and passes out in the expired air.

The composition of pure atmospheric air is 20·9 per cent. oxygen, 79 per cent. nitrogen, 0·04 per cent, carbon dioxide, and a slight quantity of moisture; the composition of dried expired air is about 16 per cent. oxygen, 79 per cent. nitrogen, and 4·5 per cent. carbon dioxide, while it contains, in addition, up to 6 per cent. of moisture.

The respiration is governed by a nerve centre in the medulla oblongata, the lowest part of the brain immediately above the spinal cord, and the nerve by which it is chiefly regulated is the vagus; if the centre in the medulla is injured respiration stops, if the end of the vagus nearer to the brain is stimulated respiration is quickened, and if the vagus is cut respiration is slowed. Stimuli through various other nerves, however, may excite the respiratory centre, and, reflected to the muscles of the chest and the diaphragm, have an effect upon the respiration; for instance, cold water suddenly dashed on the back of the head causes a person to take a deep inspiration and hold it, while in "artificial respiration," in which pressure is made upon the chest walls, the chest is enlarged and compressed alternately by moving the arms or body of the affected person, according to various methods, in order to stimulate the mechanism of respiration in cases of persons apparently drowned. The respiration is regulated by the carbon dioxide in the blood, which, when it is in sufficient quantity, stimulates the nervous centre in the medulla, which causes contraction of the inspiratory muscles, and thus the lungs receive a fresh supply of oxygen.

The *skin* is also of some slight importance as an organ of respiration, carbon dioxide being exhaled by the skin (about $\frac{1}{150}$ of the quantity exhaled by the lungs) and oxygen inspired in exchange.

THE URINARY SYSTEM

The urinary system comprises the *kidneys*, a pair of glands placed at the back of the abdominal cavity, which secrete the urine, the *ureters*, a pair of tubes along which the urine passes from the kidneys to the *bladder*, a reservoir for the urine situated in the pelvis, from which the urine passes by a tube, the *urethra*, to the exterior.

The *kidney* has a characteristic bean-shaped form, having a convex outer border and a concave inner border, with somewhat bulging extremities, while the colour is a deep brownish red. The average length is rather over 4 inches, the breadth about 2 inches, and the thickness rather over 1 inch, the weight varying usually from about 4 to 6 oz. There is a fissure in the concave inner border, termed the *hilum*, at which the ureter, the branches of the renal vein and artery, lymphatics and nerves, enter and leave the substance of the kidney.

The kidneys are situated in the upper part of the back of the abdominal cavity, one on each side of the vertebral column, usually above the level of the last rib, and the left kidney is generally placed slightly higher than the right. The posterior surface of the kidney is in relation above with the diaphragm, on the outer side with the tendon of the transversalis abdominis, on the inner side with the crus of the diaphragm above and the psoas on the inner side, and that in relation with the transversalis tendons is a large area in contact with the quadratus lumborum muscle. The kidney is in front of the transverse processes of the last thoracic and the first three lumbar vertebræ, the last rib and the transverse processes of the first two lumbar vertebræ causing depressions on the posterior aspect of the kidney.

The anterior surface of the kidney differs considerably in its relations on the two sides of the body. At the upper pole of the *right* kidney there is a small area to which the right supra-renal capsule is applied, while the whole of the remaining upper two-thirds of the surface is in close relation with the posterior aspect of the right lobe of the liver. The outer part of the lower third of the surface is in contact with the colon, and the inner part with the duodenum. The upper pole of the anterior surface of the *left* kidney is, like the right, in relation to the corresponding supra-renal capsule. Immediately below this is a small area which is in contact with the stomach, while below this again the middle third of the inner part of the surface is in relation to the body of the pancreas. To the lowest third on the inner third the jejunum is applied. On the outer part of the surface the upper two-thirds are in relation to the spleen and the lower third to the colon.

A tough fibrous coat, the *capsule*, envelops the exterior of the kidney, and if a longitudinal section is made through the organ it is found to consist of two more or less distinct layers, the outer, which has a granular appearance, termed the *cortex*, and the inner, which consist of a number of pyramidal striated masses with their apices projecting into the renal pelvis, termed the *medulla*. The substance of the kidney consists of a vast number of minute lengthy and complicated tubules, with which are associated numerous small blood-vessels. Each tubule starts in the cortex from a small dilatation termed a *Malpighian capsule*, into which projects a convoluted bunch of capillary blood-vessels termed a *glomerulus*. To each glomerulus runs a minute *afferent artery* which is a branch of an interlobular artery derived from a branch of the renal artery, and from each glomerulus comes an *efferent vein* which breaks up again into capillaries which supply the tubules. The bunch of capillary blood-vessels which composes the glomerulus has as its covering only a thin layer of flattened cells, through which the water and salts of the blood plasma, of which the urine is composed, easily pass by filtration into the Malpighian capsule of the tubule. The higher the blood pressure, the greater in proportion is the amount of fluid filtrating into the capsule, and the greater amount of urine excreted. From the capsule there proceeds a convoluted tube, the *uriniferous tubule*, which enters a pyramid of the medulla, becoming then much less convoluted, and proceeds towards the apex of the pyramid; near the apex, however, it turns upon itself, thus forming the *loop of Henle*, and, passing to the base of the medulla, re-enters the cortex, where it again bcomes much more convoluted. This part of the tubule eventually re-enters the medulla and joins a *collecting tubule*, which, being joined by numerous other uriniferous tubules, ends at the apex of the pyramid of the medulla by opening into the pelvis of the kidney. When the ureter enters the substance of the kidney it dilates within to form a narrow funnel-like sac, *the pelvis*, to which a number of conical papillæ, the apices of the pyramids of the medulla, project. The pelvis is lined with mucous membrane which is continuous with that of the ureter and the urinary bladder, and this sac acts as a preliminary receptacle for the urine before it is conveyed to the bladder. The ureter is a narrow tube of comparatively thick walls, composed of an inner or mucous coat, a middle or muscular coat, and an outer or fibrous coat, which conveys the urine from the pelvis of the kidney to the urinary bladder. The upper part of the ureter passes downwards and inwards behind the peritoneum, lying upon the psoas muscles; crossing over the common iliac artery it enters the pelvis, where the lower part of the ureter curves downwards and inwards on the side wall of the pelvis, behind the peritoneum and in front of the internal iliac artery and the obturator vessels and nerve. In the male the ureter then crosses over the seminal vesicle, in front of which it enters the bladder, while in the female it goes under the broad ligament of the uterus, lies on the outer side of the lowest part of the uterus, and then enters the bladder.

The *urinary bladder* is a sac of muscular and membranous structure, serving as a reservoir for the urine, which it receives from the kidneys and the ureters and expels from the body by the urethra. Its situation and its relations depend upon the amount of its distension; when empty it lies entirely within the pelvis, but when distended it rises up into the abdomen. The upper part of the organ is covered by the peritoneum, which passes on to it from the anterior wall of the abdomen in front, from the walls of the pelvis at the sides at the back, in the male from the rectum, over the seminal vesicles, and in the female from the upper part of the uterus.

When empty the bladder may be described as having a *base*, an *apex*, a superior surface, and two *infero-lateral surfaces.* The base is presented backwards and downwards, and, in the male, is in relation to the seminal vesicles and vasa deferentia, and, in its lower part, to the prostate gland, while in the female it is in relation to the cervix of the uterus and the highest part of the vagina. At the front of the base is the neck of the bladder, where the urethra commences, to which the prostate gland is in close relation all around. The neck is attached to the pelvis by fibrous ligaments, but otherwise the bladder is freely movable, being held in position only by the uterus, its blood-vessels, and by the peritoneum, which forms the "false ligaments" of the bladder, while behind it is supported by the rectum in the male, or the uterus in the female, and in front it receives support from the pad of fatty tissue behind the pelvis; from the apex of the bladder to the umbilicus stretches a fibrous cord, the *urachus,* which represents an important embryonic structure, the allantois. The infero-lateral surfaces of the bladder are in relation to the pelvis fascia which covers the lavator ani and obturator internus muscles, and the ureters enter the bladder at the upper angle where the infero-lateral surfaces join the base. The superior surface of the bladder is presented upwards towards the pelvis, and is in relation to part of the colon and of the small intestine, which vary accordingly to the distension of the bladder.

The walls of the bladder are composed of an incomplete outer coat of peritoneum, which, however, is only present on the upper parts of the organ; a middle coat of muscular tissue, consisting of three layers, the outer of longitudinal fibres, the middle of circular fibres, best developed towards the neck to the bladder, and the inner, which is incomplete, of longitudinal fibres; and an inner or mucous coat, which is smooth when the bladder is distended, but, being very loosely attached to the muscular coat, is greatly wrinkled when the bladder is empty, except at an area between the openings of the ureters and the urethra, the *trigone,* where the mucous membrane is tightly bound down to the middle coat. As the bladder gradually becomes distended with urine the pressure within it increases and rhythmic contractions of its muscular walls are set up; these contractions send impulses up the nerves from the bladder to the spinal cord, and as these impulses increase in power a reflex impulse is sent down the motor nerves of the bladder which causes strong contractions of the muscular walls, and the urine is expelled by way of the urethra.

The *urethra* is the canal by which the urine is conveyed from the bladder to the exterior. In the *male* the ducts of the various glands of the reproductive system also open into the urethra, and the male urethra is therefore described in the section on the *Reproductive System* (*male*).

In the *female* the urethra is a short narrow canal about an inch and a half in length, directed downwards and forwards behind the symphysis pubis, and opening upon the surface by a small slit immediately in front of the anterior margin of the vagina. The walls of the urethra are formed of an outer layer of circular and an inner layer of longitudinal muscle fibres, while the canal is lined with mucous membrane.

THE REPRODUCTIVE SYSTEM

The reproductive system includes, in the *male,* the *testicles* or *testes,* a pair of reproductive glands placed in the scrotum; the *epididymis,* the convoluted first part of the duct of the testicle; the *vas deferens,* the duct proper of the testicle; the *seminal vesicles,* a pair of receptacles for storing the *semen,* or secretion of the testicles, which join the lower parts of the corresponding vasa deferentia; the *common ejaculatory ducts,* the narrow terminal parts of the vasa deferentia, opening into the *urethra,* which conveys the semen to the exterior; the *prostate gland* and the two *Cowper's glands,* accessory glands opening into the urethra; and the external genital organs, the *penis* and *scrotum.*

In the female the reproductive system includes the *ovaries,* a pair of reproductive glands situated in the pelvis; the *Fallopian* tubes, which connect the ovaries with the uterus; the *uterus* or *womb,* in which the development and growth of the embryo and fœtus from the ovum takes place; the *vagina,* the passage from the uterus to the exterior; *Bartolin's glands,* accessory glands opening into the lower part of the vagina; and the *vulva,* which includes all the external genital organs of the female. The *mammary glands,* or *breasts,* are also included.

It should be understood that the development of the reproductive organs is practically the same in the two sexes up to the fifth or sixth week of intra-uterine life, and only then does the differentiation of the sexes begin to become evident.

The *testicles* or *testes* are two in number, and are situated side by side in the scrotum. Each is oval in shape, about $1\frac{1}{2}$ inches long, 1 inch broad, and $\frac{3}{4}$ inch thick, covered with a strong fibrous coat from which fibrous partitions go into the substance of the gland, dividing it up into compartments in which are, intricately coiled, the semin-ferous tubules, where the *spermatozoa,* or male sexual elements, are formed.

The *epididymis* lies behind and in close relation to the testis. It is a crescent-shaped body, the upper part of which is formed of a number of small twisted ducts coming from the testes. These join together to form one tube which is greatly convoluted and composes the body and the lower part of the epididymis.

The *vas deferens* is the continuation of this tube, and is composed of an outer fibrous, a middle muscular, and an inner mucous coat. It is at first also convoluted, but soon becomes straight and runs up from the scrotum, through the external and internal abdominal rings in the spermatic cord, down the side of the pelvis beneath the peritoneum, crosses the ureter, and proceeds to the base of the bladder, where it becomes dilated and then, after being joined by the corresponding seminal vesicle, narrows to form the common ejaculatory duct.

The *seminal vesicles* are two sacs, which are really tubes coiled upon themselves and held in a sac-like form by sense tissue. They lie in close relation to the base of the bladder and along the inner sides of the last parts of the vasa deferentia, into which they open. It is now considered that the vesicles are not merely receptacles for the *semen*, or secretion of the testes, but that they themselves secrete a mucous fluid which mixes with the semen.

The *common ejaculatory ducts* are two in number, each being the narrow terminal part of the vas deferens after the corresponding seminal vesicle opens into it; the ejaculatory ducts pass through the substance of the prostate gland and open into the prostatic part of the urethra.

The *urethra* is the tube about 8 or 9 inches in length, which conveys to the exterior the urine from the bladder and also the semen, or secretion of the testes, from the vasa deferentia and the seminal vesicles. It may be considered as in three parts, the *prostatic urethra*, the *membranous urethra*, and the *spongy urethra*. The prostatic urethra is the first part of the tube, which traverses the prostate gland, and into it open the common ejaculatory ducts, and the numerous small glands of the prostate. There is a slight ridge on its posterior wall, upon which is the opening of a minute pouch, the *sinus pocularus*, which is interesting as representing in the male the uterus of the female. The membranous urethra is the next part, and is between the anterior and posterior layers of the triangular ligament; it is narrower than the preceding part, and Cowper's glands are placed at each side of it. The spongy urethra is that part which is within the penis and is by far the longest of the three parts; it is contained in the corpus spongiorum of the penis, the two corpora cavernosa lying on each side above it, while into it open Cowper's glands and a number of minute mucous glands.

The prostate gland is a cone-shaped structure, its length $1\frac{1}{4}$ inches and its breadth slightly more, composed partly of glandular and partly of muscular tissue, and covered with a strong fibrous capsule. It lies below and behind the symphysis pubis, with its base in close relation with the lowest part of the urinary bladder, its apex pointing downwards and forwards, and its substance is traversed by the urethra and by the ejaculatory ducts from the seminal vesicles, that portion of the gland between the ducts and the urethra being termed its middle lobe. The secretion of the prostate, which is a whitish, mucous fluid, and acts as a lubricant of the urethra, is poured into the prostatic part of the urethra by numerous small ducts.

Cowper's glands are two tiny spherical bodies, placed one at each side of the membranous urethra, behind the bulb of the corpus spongiosum, and the duct of each gland opens into the spongy urethra. They secrete a mucous fluid which also acts as a lubricant of the urethra.

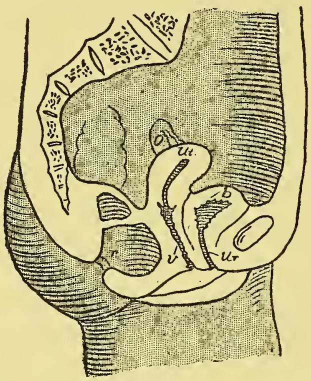
The *penis* is composed of three cylindrical masses of erectile tissue, covered with subcutaneous tissue, and skin. Two of the cylindrical masses, the *corpora cavernosa*, are situated above, side by side, and one, the *corpus spongiosum*, in which the urethra runs, below, in the middle. At the root of the penis the two corpora cavernosa become thicker and more fibrous and are joined at each side to the arch of the pubis; while the corpus spongiosum enlarges to form the bulb, which is attached to the triangular ligament. At the anterior part of the penis the corpus spongiosum enlarges to form the glans, which forms the whole part of the organ, and is covered by the foreskin. A fibrous ligament, the suspensory ligament, attaches the body of the penis to the front of the symphysis pubis. Erection of the penis is due to venous congestion of its erectile tissue, particularly of the corpora cavernosa; this is caused by the muscles contracting and pressing upon the veins conveying the blood from the erectile tissue, in response to impulses sent down the lumbar nerves.

The *scrotum* is the pouch in which the testicles are placed. Its walls are composed of skin, superficial fascia, and a layer of muscular fibres termed the *dartos*, and internally it is incompletely divided by a septum, each testicle lying within a serous sac, the *tunica vaginalis*, which is primarily derived from the peritoneum of the abdominal cavity.

In the *female*, the *ovaries* are two in number, almond-shaped and about an inch in length, situated one on each side within the pelvis, and joined by short folds of peritoneum to the broad ligaments which attach the uterus to the sides of the pelvis; a definite musculo-fibrous ligament also attaches the inner end of each ovary to the upper angle of the uterus. Embedded in the fibrous tissue of the substance of the ovary are little masses of epithelial cells from which the *Graafian follicles* develop and gradually make their way to the surface. When a follicle is ripe it bursts upon the surface, and an *ovum*, the female sexual element, is set free.

The *Fallopian tubes* lie one on each side of the upper borders of the broad ligaments, and serve to convey the ova from the ovaries to the uterus, into the upper angles of which they open. Each has an outer coat of peritoneum, and is composed of a muscular coat, the fibres of which are arranged longitudinally and circularly, and a mucous lining. The distal end of each tube has in it a small opening into the peritoneal cavity of the abdomen, and has fringes, or *fimbriæ*, hanging from it, the largest of them being attached to the ovary. An ovum discharged, as has been seen, upon the surface of the ovary, thus passes actually into the abdominal cavity before being swept by the fimbriæ into the Fallopian tube and so to the uterus.

The *uterus* or *womb* is a pear-shaped, muscular, hollow organ, about 3 inches long, 2 inches broad at its wider part, and nearly 1 inch thick, in the non-pregnant condition. It is usually described in three parts, the *fundus* or upper rounded part, above the entrance on each side of the Fallopian tubes, the *body*, rounded and continuous with the fundus, gradually diminishing in breadth, and marked off by a slight constriction from the *cervix*, which is the lowest part of the uterus, narrower and more cylindrical than the body. The cervix presents into the vagina a knob-like, rounded, lower extremity, in which is a minute opening in the middle of a central dimple on the surface, termed the *os externum* of the uterus. The walls of the organ are very thick in comparison to its internal cavity, which is practically a triangular slit placed laterally, the anterior and posterior walls being almost in contact, and it is lined with smooth mucous membrane. The lower part of the cavity, the *cervical canal,* is wider in the middle than above and below, the mucous membrane of its walls being thrown into a series of folds termed the



The Female Reproductive System.—*O*, left ovary; *Ut*, uterus (womb); *v*, vagina; *b*, bladder; *Ur*, urethra; *r*, rectum.

arbor vitæ. The normal position of the organ is that of anteflexion, *i.e.* it is bent forward upon itself so that the body and cervix meet at an acute angle. From each side of the organ the *broad ligaments,* formed of a double layer of peritoneum, go out to the wall of the pelvis. To them are attached the ovaries, and they contain several important structures, including the Fallopian tubes, and the muscular *round ligaments,* which proceed forwards on each side to the inguinal canal and end in the subcutaneous tissues; these ligaments have an important share in holding the uterus in position.

The *vagina* is the passage, about 3 inches in length, directed downwards and forwards, which leads from the uterus to the exterior. Its walls are muscular, and it is lined with mucous membrane, its lower end (into which open a pair of very small glands, *Barotlin's glands,* representing Cowper's glands of the male), being incompletely closed in the virgin by a fold of mucous membrane termed the hymen.

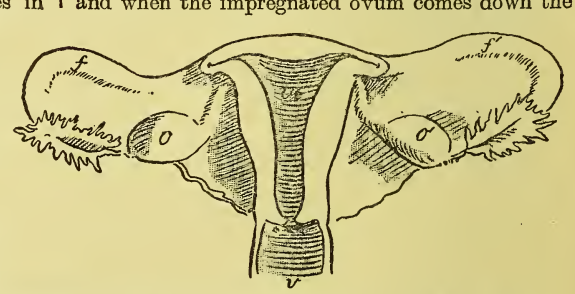
The *vulva* includes all the external genital organs of the female, and includes the *mons veneris,* the fatty pad covered with hair in front of the pubis; the *labia majora,* the folds of skin extending at each side from the *mons veneris* almost to the anus, and representing the scrotum of the male; the *labia minora,* a pair of smaller folds of skin lying internal to the labia majora, enclosing the clitoris in front; the *clitoris,* which is the representative of the penis of the male, composed like it of erectile tissue, and the most sensitive part of the female genital organs; and the *urethral orifice,* which is a puckered opening just in front of the anterior margin of the vagina and about an inch behind the clitoris.

The *mammary gland* or *breast* is the gland in the female which secretes milk and by means of which the young are suckled, being present in the male only in a rudimentary form. The mammary glands are two in number, and are situated on the front of the chest, where they form symmetrical prominences of greater or less degree, extending in the adult from about the third to the seventh ribs. In the centre of the surface of the gland is a darker patch of skin, the *areola,* from which arises a conical projection, the *nipple.* The gland is composed of about a score of lobes arranged in a circle, branching to form smaller lobules, bound together with connective tissue and embedded in fat, which forms the chief bulk of the breast. From each lobe proceeds a duct which opens on the apex of the nipple. The mammary glands become considerably enlarged during pregnancy, and very shortly after the birth of the child milk begins to be secreted.

In the physiological process of *menstruation* there is a discharge of blood mixed with mucus and mucous membrane from the cavity of the uterus. This discharge takes place in women about every twenty-eight days during the period of her life in which she is capable of bearing children, that is, from about the age of fourteen to about the age of forty-six or forty-eight.

As the Graafian follicle in the ovary becomes ripe, changes take place in the uterus in preparation to receive it, the mucous membrane of the cavity increasing in thickness and in vascularity, and becoming soft and thrown into folds, and the walls of the cavity come together so that the cavity is obliterated. The ripe ovum is discharged on the surface of the ovary, swept up by the fimbriæ into the Fallopian tube, and passes down into the prepared uterus.

When impregnation of the ovum by the male sexual element, or spermatozoon, takes place, which occurs usually at the distal end of the Fallopian tube, the mucous membrane of the cavity of the uterus undergoes further changes, and when the impregnated ovum comes down the



The Female Reproductive System.—*Ut*, uterus in section; *v*, vagina; *f*, *f′*, Fallopian tubes; *o*, *o′*, ovary.

Fallopian tube into the uterus it becomes implanted in a convolution of the uterine mucous membrane, and further development of the embryo ensues. This is the beginning of the physiological condition of *pregnancy.*

On the other hand, when impregnation of the ovum does not take place, the ovum enters the cavity of the uterus as before, but then fluid is effused which devitalises the prepared but unwanted uterine mucous membrane, and this is discharged, leaving a raw surface which is soon covered with new mucous membrane. The menstrual flow is, therefore, the getting rid of the preparations made by the uterus in expectation of pregnancy, accompanied by the discharge from the body of the unimpregnated ovum, which is, of course, a microscopical body.

The Ductless Glands.—Under this inclusive title are grouped a number of organs which resemble one another only in the fact that their respective secretions are what are called "internal secretions"; that is, they are not conveyed away from the organs by ducts, but enter directly into the lymph or the blood stream by the lymph vessels or by the veins which arise within and pass from these organs.

The ductless glands, then, include the *spleen*, the *thyroid gland* and the *parathyroids*, the *suprarenal capsules*, the *thymus gland*, the *pituitary body*, the *pineal body*, the *carotid gland*, and the *coccygeal body*. Certain other organs, such as the *pancreas*, the *testes*, and the *ovaries*, have internal secretions in addition to their other, or external secretions. The internal secretion of the *pancreas* is believed to affect the assimilation of sugar in the tissues. The internal secretions of the *testes* and *ovaries* affect the development and growth of the tissues and have an influence upon the nervous system, while in the female the internal secretion of the ovaries affects the development particularly of the mammary glands and the secretion of milk in them.

The *spleen*, the largest of the ductless glands, is a solid vascular organ, situated deeply in the upper part of the abdomen at the left side, in front of the curved back part of the diaphragm, and behind the stomach and the left kidney. It is irregular in shape, 5 inches long and 3 inches wide, of purple colour, soft and pulpy in consistence, and covered with a strong capsule. In the middle of its anterior surface is a slit, or *hilus*, by which vessels and nerves enter and leave the organ. Its substance has a framework of muscular fibres and connective tissue in the meshes of which is placed the cellular elements, or *pulp*, held together by a fine network of fibrils. Through this pulp the blood is poured as through a sieve, coming, as it comes nowhere else in the body, into actual contact with the cells of the tissue, and is then collected in venous sinuses which unite to form the splenic vein at the hilus. The muscular framework of the spleen contracts rhythmically, so that the organ alternately contracts and expands about once every minute.

The chief function of the spleen is that of a filter of the blood, taking from it and destroying the worn-out red blood corpuscles and particles of foreign matter such as certain disease-causing organisms which have the blood as their habitat; it has also a controlling influence upon the blood stream. The spleen is supposed to take part in the formation of new white and red blood corpuscles, but the evidence is not yet strong enough to assign this as a definite function.

It has been shown that the spleen is not essential to life, and when it is excised its functions are to some extent assumed by the lymphatic glands and the bone marrow.

The *Thyroid Gland* is situated in the front of the neck, and is a two-lobed structure, connected by an isthmus of gland tissue, firmly clasping the upper end of the trachea. The gland is very well supplied with blood-vessels, four (sometimes five) large arteries conveying blood to it, and six large veins from it. The substance of the gland is composed of minute cavities, lined with cubical cells, and filled with an insoluble gelatinous material, while in the walls of the cavities the small blood-vessels interlace freely.

The internal secretion of the thyroid gland has a considerable action upon the development of the tissues generally and is especially associated with the development and growth of the generative organs; it has also an important influence on the nervous system. As showing the importance of the thyroid secretion mention must be made of the disease *Myxœdema*, which is due to atrophy of the thyroid gland and is characterised by a peculiar thickening of the skin, a gelatinous overgrowth of the subcutaneous tissues, and mental defects. *Cretinism*, the infantile form of myxœdema, is due to non-development or early atrophy of the thyroid, and is manifested by stunted growth, mental defects, subcutaneous swelling, and sexual non-development. Both these diseases can be cured, or at least greatly alleviated, by administration of the extract of the thyroid gland. The administration of too much extract causes wasting, thirst, rapid beating of the heart, digestive and mental disturbances, symptoms which resemble those of *Grave's disease*, a disease characterised by enlargement of the thyroid gland and projection of the eyeballs.

The *Parathyroids* are small yellowish bodies lying, two on each side, in close relationship to the thyroid gland. They consist of columns of polygonal cells enclosed in a fibrous framework. Their removal is followed by peculiar symptoms, spasmodic movements like those of tetanus, and a gradual wasting of the tissues, but the action of their internal secretion is not yet known.

The *Suprarenal capsules* are two triangular flattened bodies which lie, one on each side of the spine, on the upper end of the corresponding kidney. Each capsule is supplied by three arteries, and from each one large vein conveys away the blood. The gland-substance of each suprarenal capsule is composed of an outer firm, yellowish part, the *cortex*, and an inner pulpy, brownish part, the *medulla*. Both parts have a fibrous network, but in the cortex the cells of the gland are arranged in groups around which are arranged the blood capillaries, while in the medulla are thin-walled blood sinuses surrounded by the medullary gland cells.

The internal secretion of the suprarenal cortex is associated with the development and growth of the generative organs, while the internal secretion of the medulla acts with a stimulating effect upon the blood-vessels, the heart, and other muscular structures, probably fortifying the action of the sympathetic nervous system. Mention must be made of the disease called *Addison's disease*, which is associated with destruction of the tissue of the suprarenal capsules, and is characterised by great muscular weakness, wasting, a peculiar patchy bronzing of the skin, and digestive disturbances.

The *Thymus gland* is a body situated in the thorax, in front of and above the heart and the commencement of the great blood-vessels. It is composed of a great number of small lobules of lymphoid cells, resembling the cells of lymph glands, among which are found peculiar little bodies termed Hassall's corpuscles. The thymus gland is of most importance during the early development of the child, its size increasing up to about the time of birth, after which it decreases, atrophying after the age of puberty. Its internal secretion appears to influence the development of the tissues, the place of the thymus secretion being taken in the later stages of development by the internal secretion of the testes or ovaries.

The *Pituitary body* is a small oval structure situated in a hollow on the body of the sphenoid bone in the floor of the skull. It consists of two distinct lobes, the anterior being the larger, closely applied to one another. The anterior lobe is developed from a part of the early alimentary canal, and it consists of minute cavities lined with epithelial cells, and also of solid masses of similar cells, bound together by a vascular connective tissue. The posterior lobe is developed from the nervous system—it is in connection with the brain by the stalk coming from the *tuber cinereum*, a prominence on the under surface—and its substance consists of nervous connective tissue and fibres, in which is found colloid matter. The action of the internal secretion of the anterior lobe is to stimulate the growth of the tissues and particularly the growth of the connective tissues, including bone. A peculiar disease, called *Acromegaly*, characterised mainly by overgrowth of the bones, is associated with tumours of the anterior lobe of the pituitary body. The internal secretion of the posterior lobe acts mainly upon the blood-vessels and the heart, probably, like the suprarenal secretion, assisting the action of the sympathetic nervous system.

The *Pineal body* is a small reddish structure, of the size and shape of a cherry stone, situated at the back of the brain, to which it is attached, immediately above the *pons varolii*. It is a rudimentary structure representing a primitive dorsal invertebrate eye. Its substance is composed of epithelial cells, and it is believed to secrete an internal secretion, the action, if any, of which is not known.

The *Carotid gland* is a minute body situated in the neck at the bifurcation of the common carotid artery into the external and internal carotid arteries. Many minute capillary arteries enter its substance, which is composed of a number of little masses of polyhedral cells. It is believed to have an internal secretion, the action of which is unknown.

The *Coccygeal body* is a minute structure situated in front of the tip of the coccyx, its substance resembling that of the carotid body; the action of its internal secretion, if any, is not known.

R. Scott Stevenson, M.B.

HEALTH IN THE HOME

INTRODUCTION

Within recent years it has become increasingly common for certain persons, more especially those who base their conclusions with regard to health, disease, and death mainly upon statistics, to belittle the influence upon human beings of the character of their surroundings.

To such observers the one important thing is heredity.

Ensure for a child a healthy father and a healthy mother, say they, and nothing else matters. Food is of comparatively little importance; housing, good, bad, or indifferent, sanitary or insanitary, is of no importance.

Does a baby die? Look at the father and the mother: their health, their habits, and their character; these will give you the reason for the death of the child before the period of infancy has been passed.

To many this is a soothing doctrine. The jerry builder, the parsimonious town councillor, and the house-farmer accept it joyfully.

Many others accept it too, amongst them a number of sanitarians, professional—medical officers of health and so on—and non-professional.

Others—and this is perhaps the largest class of all—see something in the view but refuse to regard it as the whole explanation.

Statistics or no statistics, they say, our practical experience and knowledge forbid us to believe, for example, that the chance of the person who lives in a narrow street into which the sun never peeps, in a room through which a current of air never passes and which is always dark and dingy except when the lamps are lighted, is as good as that of the other who has space about him, who sees and feels the sun now and then, and regularly or occasionally can let a breath come in from outside and sweep the faded air from his room.

It sounds almost incredible that anyone should seek to belittle the importance of surroundings; should try to say that there is little or nothing in the healthy home idea, and that immediately, all those who have been labouring to make the poor and the ignorant understand how much better they would be if they got and kept their homes healthy should cease such work and turn their attention to the marriage question, in so far, at least, as this affects child-bearing.

Prevent unsuitable parties from marrying, and give sanitation a rest, is the advice offered.

Sanitation may not have the importance that was attached to it a few years ago, but it still has some importance. Is it not just possible that it may have something to do with the making of parties to marriages unsuitable? Practically all the statistics upon which the view just mentioned is founded are statistics of deaths.

But death is not everything. It is impossible to consider death as the absolute criterion of health.

Those who have done practical work in the homes of the people: those who have seen properly situated and properly constructed homes and have compared them with those that are improper: those who have compared the inhabitants of the one with the inhabitants of the other, making due allowance for other conditions, personal and otherwise, know that it is not so.

Even the man in the street knows that it is not so. He knows that there are any number of stages between health and disease and disease and death.

The person who has worked practically at the problem knows how capable are the conditions surrounding the individual of making the healthy man an unhealthy man, a man with a disease, and eventually even a dead man.

He may not, this practical worker, be able to express what he knows in figures or even in words. He may not, indeed, be able to give a name to the condition from which the person damaged by his surroundings is suffering, may not be able to indicate which of the surroundings is responsible for the trouble.

He knows what the bad surroundings are; he knows what they should be to be right. He sees what the bad surroundings are capable of doing; he has seen what improvements have resulted when they have been amended.

But why should it be only the person who is working at these things who should know? There is no special secret about it; indeed there is no secret at all. We all have to live somewhere; we are all liable to be affected by bad surroundings.

Why should we not all know enough to be able to recognise and so be able to avoid bad surroundings?

The public pay to have their health protected; they maintain a service—the Public Health Service—which has no other purpose than to see that they are protected.

On account of the size of this service it cannot give attention to every individual member of the public personally.

The person who is likely to get the greatest possible value out of the service is he who knows when to call its representatives in.

In the following articles an attempt is made to describe as clearly as possible, and to distinguish the one from the other, good and bad sanitary conditions, and to show how the latter may affect health or cause disease.

And the object of the articles is, partly to induce the individual to see to his own health, and partly to encourage him to turn to the service referred to above, which has been provided by and for the people, whenever he feels that assistance could or should be obtained from it.

HEALTH IN DWELLING-ROOMS

Space and Overcrowding

The natural, perhaps even the ideal, life is that which is lived out of doors. The reasons which led the cavemen to seek a cave and other prehistoric peoples to construct homes of leaves and branches, staves and mud and stones, and so on, are the same, to all intents and purposes, as those that drive the moderns into their mansions, their flats, their cottages, or their tenements of one or two rooms.

Of all the reasons the chief is protection: protection from the elements, which burn or freeze or drown: protection from foes who rob or wound or kill: protection from friends who interfere with privacy.

If protection is obtained, however, something of the utmost value is lost, viz.: Nature's spaciousness and bounteousness in the matter of light and air.

In place of bigness is smallness: in place of the natural the artificial.

But the natural in man demands the natural. He cannot live naturally, that is, healthily, if he is deprived entirely of those things that Nature provides so liberally. He must have space, he must have plenty of air, he must have plenty of light.

At the same time, he must have protection from the factors mentioned.

Artificial conditions are forced upon him. He must bear with them and make the best of them. The way to do this is to so adapt, arrange, and modify the artificial conditions that they shall come to resemble the natural.

All the space possible must be obtained and made the most of, not wantonly wasted. The same share of the air and light so bounteously provided by Nature must be obtainable within as without, and it should as far as possible be the same air and the same light inside as out.

The problem of how to make the artificial conditions as little artificial and as like the natural as possible: to so simplify them that they will exert little or no evil influence on the individual compelled by circumstances and civilisation to depart from Nature, is the problem of hygiene.

The work of those whose life's work is hygiene is largely teaching work. They have to teach governments, corporations, companies, and individuals that they have all a part to play in the making of the artificial like the natural. Outside are the three great essentials of life, of the healthy life—space, air, and light.

If they are shut outside when the individual shuts himself in, then his health inevitably suffers.

Conservation of Space.—To those desirous of leading healthy lives the first great lesson to be learned is the importance of space in relation to health. In any room space is so valuable that it must be economically used, and a limit must be fixed to the number of occupants of, and the amount of furniture in the room.

From the point of view of health, the most important thing space can contain is air. Everything else introduced is there merely to serve some subsidiary purpose in connection with living: some are useful—chairs, tables, beds, and so on; some are only ornamental.

The air is the chief thing, and in arranging for the others, it must never be forgotten that all the space possible must be left uninterfered with in order that the largest share may be left for the air.

The importance of space in relation to growth and development must also be borne in mind.

Especially in childhood, movement is absolutely essential.

If the limbs and the muscles are to grow, they must have room to move about in. In their movement, the brain plays a considerable part, instructing them how to move; learning from their movements how they can move. Directly and indirectly from the exercise of the limbs and muscles the brain is stimulated.

Directly, because it acquires the art of reasoning and thinking, and remembering—reasoning out why certain movements take place, thinking what will happen if certain movements are carried out, remembering that certain effects, pleasant or unpleasant, were experienced when certain movements were on a former occasion induced.

Indirectly, there is stimulation, because no movement occurs without an increased flow of blood and an increased distribution of nourishment. In this, of course, the brain shares; and growth of that organ, as of any other in the body, depends largely upon feeding.

In a less degree, perhaps, than in childhood, movement produces such effects in the adult also. Its importance in this connection even in them must not be overlooked.

Primarily, however, it is so that more air can be accommodated that, especially in rooms, all the space possible is required, and that what there is should be safeguarded.

Curiously enough, it is perhaps in the homes of the poor that the most extravagant and sinful waste of space is found.

Unable to pay for much more than they require for their own bodies, in addition to the absolutely essential air, these people almost invariably throw it away upon other articles.

Furniture, the great bulk of it useless, valueless, and unornamental, is crowded into the space. No thought is given to anything save the getting of it in. Often it is not arranged with any regard to convenience: never is it disposed so that the greatest advantage shall be taken of the space as an airholder, or so that free movement shall be possible.

As a matter of fact, it is only amongst the comparatively well-to-do, those that can best afford it, that space is ever seen properly used. By these no false shame is shown in having a room comparatively bare of furniture. They feel and recognise the necessity for air, and room to breathe it in, and do not give to furniture what they want themselves.

Overcrowding.—Important as is the necessity of avoiding interference with air space by avoiding overcrowding with inanimate objects, much more important is it to avoid overcrowding with individuals.

It is often possible, by arranging furniture and such like, to minimise their effect upon air. Because individuals, besides to some extent reducing the amount of space for the air, also use the air up, it is practically impossible, except by limiting the numbers in the space, to prevent their interference with it.

The person who desires to have and to retain health must of necessity be selfish. His space and his air he must have for himself: he cannot afford to share it with anyone else. The moment another individual intrudes, a silent fight for these necessities begins, and in the contest both suffer. The extent of the suffering depends upon the duration of the struggle, upon the time the air is shared, and the space overcrowded. The effects are shown upon health, and the signs are those usually associated with starvation in the matter of air and in the reduction in the opportunities for movement.

Effects of Overcrowding.—They are best seen in the child whose share of space and air is insufficient: the skin is dirty and pale, the eyes are heavy, puffy, and ringed; the limbs and body are stunted in growth; the brain and intelligence are enfeebled, there is weakness and an absence of the natural desire for exertion, there is poorness of appetite, poorness of blood, and weakened resistance.

The diseases to which this weakening of resistance is most markedly shown are those commonly known as the infectious diseases, those produced by germs.

Amongst these may be named scarlet fever, measles, diphtheria, and almost most importantly, tuberculosis or consumption.

This last is practically the disease of overcrowding, because where there is overcrowding, there also is consumption. The overcrowded is the chief victim of the consumption germ.

Weakened tissues and organs are its favourite foods, and so commonly is it seen amongst those whose tissues and organs have been starved by insufficiency of space, and consequently air, that it would almost seem as if it was capable of recognising them and making them objects of attack.

Probably this is more apparent than real, but though others whose powers of resistance have been lowered in other ways, or who seem more or less healthy, occasionally fall victims to consumption, it is conspicuously the person who lives or has lived under overcrowded conditions who suffers.

Support is lent to this view by the frequency with which the ravages of the disease are stopped when the individual is removed from his overcrowded surroundings, and provided with plenty of air, and room in which to take advantage of it.

Associated with the overcrowding there are, of course, other causes of liability to attack. Of these, the chief is starvation. But starvation alone will no more cause consumption than will proper feeding cure it. Nothing so much lowers resistance as does overcrowding and deprivation of plenty of pure air. Want of food or insufficient or improper food may assist in the lowering of resistance, but not to such an extent as the other. Even a person with a hereditarily weak resistance can be saved from attack by ensuring for him a sufficiency of air and space even though the food-supply is insufficient.

Make such a person endure overcrowded conditions, and attack is almost inevitable. With a hereditarily healthy person it is no less so.

Overcrowding is indeed the most serious problem of the present day. It is the one which gives health authorities, more especially those in large towns, the greatest amount of difficulty to deal with.

As can readily be understood, poverty is at the root of the whole matter.

Compulsory legal powers are given to local authorities, and through them to their public health officers, to deal with housing and with overcrowding, but the moment there is an attempt to put them in force with regard to the latter, a cry is raised by the people affected.

The poor do not overcrowd because they want to overcrowd. In the vast majority of instances a man does not put his wife and children into a single-roomed tenement because he wants to. It is because he cannot afford to pay rent for more than one room.

He may be perfectly willing to listen to those who tell him what is likely to happen to himself, his wife, and his children if he continues to overcrowd. He may be able to recognise that injury to health is inevitable, and that the string of signs and symptoms and dangers referred to above are likely to occur: but what can he do?

If he is ordered under legal pains and penalties to cease the overcrowding, what happens? He merely leaves the one overcrowded tenement and goes to another. And it is no easy matter to find another: some landlords make most searching inquiries, and refuse to let rooms to anyone likely to give rise to overcrowding. They do not wish to have sanitary officers in and out of their property, because they fear that expense will be caused to them.

The man who is once charged with overcrowding and has abated it by leaving the one overcrowded room for another is nearly always detected again. He is harried from place to place: he is continually looking for rooms; continually on the move, continually exposing himself to rebuffs from landlords and house-farmers; and if poverty is the reason of the overcrowding, little or no good is done to anyone.

Overcrowding is indeed a difficult problem, but it is a problem as much for those bent upon improving social conditions as for those whose work is sanitary reform.

Reduce or abolish poverty and there will ensue a considerable falling off in the amount of overcrowding. Improved housing must be accompanied by improved wages, otherwise no particular good will be done.

Important as overcrowding in relation to rooms is, the fact that there is considerable objection to overcrowding of outside space must not be overlooked.

If there is to be a sufficiency of air inside dwellings, there must be open spaces outside to draw it from. The oppression produced in narrow streets, and in courts and alleys where houses are huddled together, and where the only thought has been to utilise every foot of ground for building operations, is entirely due to overcrowding and to defective ventilation in these places.

The ideal house is one which has open spaces all round, but if this cannot be obtained, as unfortunately it so often cannot in large towns by any except the wealthy, then care should be taken to find a house in which there is a wide space in front and a wide space behind, both open at both ends.

If this is done, then the chances of obtaining a comparatively clean air will be increased, and some of the evils of overcrowding will be avoided. Bad as the overcrowded room is, when it is situated, in addition, in an overcrowded neighbourhood, as it so frequently is, the conditions are very much worse, and the dangers very much greater.

As illustrating the importance which is attached to the relation between housing, more especially overcrowding, and consumption, special attention may be directed to the following remarks which appear in the final report of the Departmental Committee on Tuberculosis.

Speaking of housing, they say:

"The committee believe that much may be done to assist in preventing tuberculosis by improvement of the housing conditions in this country. There is no doubt that dirty, ill-ventilated, dark, damp, and otherwise insanitary houses are provocative of the disease. There is equally no doubt that *the incidence of the disease is greater where families are crowded into one or two dirty and unventilated rooms, than where better conditions are obtainable, or where the rooms are kept clean and ventilated.* The air of an overcrowded room rapidly becomes and usually remains foul, lowering the vitality of the occupants. *Light, fresh air (or at least movement of air), and space are the conditions which it is most desirable to obtain.*

"The committee are aware that light and fresh air are more difficult to obtain in cities, and that, even where fresh air is obtainable, the poorer classes are often driven to keeping their rooms stuffy and ill-ventilated, owing to the expense of providing sufficient clothing and artificial heat to maintain adequate warmth. The committee fully realise the difficulties surrounding the housing question, but they consider improvement in the present state of affairs both desirable and possible, and that, even amongst the poorest, an increased appreciation of the importance of cleanliness and ventilation, &c., would tend to decrease the ravages of the disease."

Apart from tuberculosis, other diseases which are apt to be associated with overcrowding to which special reference may be made are, influenza, pneumonia, and two others only recently sprung into importance, viz. infantile paralysis, and cerebro-spinal meningitis, more commonly known as "spotted fever."

Of influenza, little really need be said; with its symptoms, its infectiousness, and its effects, the majority of people are quite well acquainted.

Because it is highly infectious it tends to spread amongst those who are overcrowded and compelled to breathe, therefore, foul air. Because they are weak in resistance both to infection and the effects of the disease, the consequences are often serious.

Pneumonia is a disease not sufficiently widely recognised as infectious, and one, moreover, peculiarly associated with bad housing conditions. Like influenza, with which it is often associated, it tends to attack those with weakened resistance and to produce in them the most serious results.

Infantile paralysis and cerebro-spinal meningitis are, so far as is known at present, dirt diseases, and the last-named has more or less come to take the place of the practically extinct but formerly much dreaded typhus fever.

Both of these diseases are attended by marked feverishness, and in the early stages great pain, usually in the head, but sometimes in other parts. They affect mainly the nervous system, and when it does not cause death (and it rarely does), the former practically always leaves behind it paralysis of one or more parts of the body. Spotted fever not infrequently kills, but if the patient does recover, he is usually more or less severely damaged. Blindness, deafness, and paralysis of some more or less important organ are common sequels, and mental derangement, even insanity, not unknown.

The association of the commoner infectious diseases—scarlet fever and so on—with overcrowding, has already been remarked upon. For reasons sufficiently fully described they spread markedly where such a condition exists, and because of it recovery, if it should result, is slow and often incomplete.

Standards of Overcrowding.—The standard of overcrowding is based upon the amount of cubic space which can be regarded as the minimum in which a person can live more or less healthily.

It is calculated in relation to the quantity of air required by the individual per hour, and it is always taken for granted that the air can be got into and out of the space.

Apart from the air space standard there is no other. Except in so far as it comes in in relation to cubic capacity, no limit of floor space in the case of domestic dwellings has ever been definitely laid down. This probably is partly because it is inconvenient to do so; partly because the requirements would be difficult to enforce. Moreover, it should be noted that the legal standards of air space apply only to such rooms as are used for sleeping or workroom purposes, and only to a certain class of property.

According to those who first really gave serious attention to the question of air space and ventilation, the smallest amount that should be allotted per head is 1000 cubic feet. By providing each person with between 80 and 85 square feet of floor space in a room not more than 12 feet high, such an amount can be obtained.

The reason for limiting the height to 12 feet is to encourage the tendency which air when warm has to ascend and when cold to descend. The extent to which the falling occurs is limited, and if the air has once reached a height of more than 12 feet it does not fall so readily nor so low as to be taken advantage of by human beings before it once more becomes heated and compelled to ascend.

When the height is less than 12 feet other objections come in, viz. that the occupants are too much compelled to breathe the warmed and vitiated air which has passed into the upper reaches. This objection increases with every foot less than 12 that is obtained. No room certainly should be much less than 8 or 9 feet high, and if less than 7 feet should not be occupied, since ventilation of a room no higher than this is almost certain to be defective, and each occupant certain to get much more than his fair share of the foul, warm air which has ascended towards the ceiling.

The reason for fixing 1000 cubic feet as the ideal minimum is that with this amount the problem of ventilation becomes comparatively simple.

Ventilation

Ventilation.—The word "ventilation" means "wind-bearing or carrying," and wherever ventilation is required (and it is required everywhere) there must be bearing, carrying, or flowing of air. To get the full advantage of the air, the flow must be neither too fast nor too slow. If it is too fast, the sensation of draught is caused; that is to say, the skin either over the whole or a part of the body is fanned too vigorously, the heat is taken away from it too quickly, and it becomes chilled. If it flows too slowly the air gets heavy and hot, the skin and body keep too much of their heat, and the individual soon feels uncomfortable.

Chiefly what the flowing air is expected to carry with it when it comes fresh into a space are cold, or perhaps better coolness, and oxygen, and when it passes away when finished with, heat and carbonic acid gas. The rate of flow which is regarded as the happy mean for air flowing into and out of a space is about three feet per second.

Given proper and sufficient inlets and outlets, with a space per head of 1000 cubic feet, it is never necessary to exceed the minimum rate of flow, so that draughts need never occur, and one difficulty in connection with ventilation is overcome. Further than this, however, a sufficiency of air—an air containing enough oyygen and not too much carbonic acid and not too much heat—is also under average normal climatic and other conditions likely to be provided.

To explain how it becomes possible to make such definite statements as the foregoing, it is necessary to say first a few words with regard to the composition of air, and to show what happens to it when it is breathed by a human being.

Composition of Air.—Air consists of a mixture of gases, of which the chief are oxygen, nitrogen, and carbonic acid, and contains a certain amount of moisture. The oyygen is the most useful constituent so far as life is concerned, since without it life cannot be maintained.

Carbonic acid, harmless or nearly so in minute quantities, becomes, in quantities little more than minute, a poison producing a certain train of symptoms, and in larger quantities an agent capable of causing death. The chief source of carbonic acid is the burning up of carbon, or of substances containing carbon. For this process the presence of oxygen is required, and while it is taking place the carbon and the oxygen unite, the result being the formation of carbonic acid gas.

In the human body this burning up of materials containing carbon is continually going on; practically all food contains quantities of this substance, and the burning or breaking up is necessary for the support of the tissues. The tissues themselves contain carbon, and they also are being burned up in connection with movement, growth, and development. Because of this, large quantities of carbonic acid are produced, and are given off through the lungs when air is breathed out, exhaled, or expired. When given off it enters the air, and when the air is contained in a closed space, naturally, the quantity of carbonic acid gas is increased, and continually increased with every breath given out by the individual.

The quantities which any person is capable of giving off in a definite time have been calculated; the quantities which are normally contained in air have been discovered; and, in addition, as a result of a number of experiments performed on man and animals, the amounts of carbonic acid which a person can breathe with safety, the amounts which will cause unpleasant symptoms, and even the amounts which will threaten life, are all known. Knowing these figures, and regarding carbonic acid gas, as is usually done for the sake of convenience, mainly because its presence and amount are easily estimated, as the most dangerous constituent of air, it is comparatively easy to decide what amount of air must be given to an individual.

For all practical purposes air may be regarded as containing ·04 parts of carbonic acid gas per cent. In the air which is exhaled by a human being the amount is 4 per cent; the average total amount given off by an adult in an hour being 0·6 of a cubic foot.

Air containing pure carbonic acid gas to the extent of 10 per cent., when breathed, is exceedingly poisonous. In the case of the carbonic acid contained in expired air it is so far from being pure, being associated with other harmful substances in the breath, that less than 10 per cent. will cause poisoning. As a matter of fact, it has been found that discomfort is caused when the air to be breathed in contains more than ·06 per cent. carbonic acid gas, distinctly disagreeable symptoms being produced by so little as ·12 to ·14 per cent. What must be done, then, is to ensure that the amount is kept down to ·06 per cent.

On the facts and figures given above, it is no difficult task to discover how this is to be done. Ordinary air contains ·04 per cent., or more conveniently ·4 of a cubic foot, in every 1000 cubic feet of carbonic acid: an adult gives off ·6 of a cubic foot in an hour: air to be good must contain not more than ·06 per cent. or more conveniently ·6 per 1000. All air must, therefore, be taken away from an individual as soon as or before he has added ·02 per cent. or ·2 per 1000.

Giving off ·6 of a cubic foot in an hour, obviously he will give off ·2 in a third of an hour, and, in that time, will raise the ·4 naturally present in a 1000 cubic feet of air to the limit of ·6.

No human being should be required, therefore, to use 1000 cubic feet for longer than twenty minutes. In other words, he must be provided with a fresh 1000 cubic feet of air three times in every hour, or with 3000 cubic feet per hour. This should be regarded as the minimum, and the ease with which it can be provided depends upon the size of the space which he occupies.

It has already been stated that air must not, if draughts are to be avoided, be allowed to flow in at a more rapid rate than 3 feet per second. The larger the space, naturally the slower need its movement be. When the space occupied by the individual is 1000 cubic feet, a flow of 3 feet per second will lead to a complete changing of the air content three times per hour, and will provide the three changes necessary to keep the carbonic acid gas down to ·6 parts per 1000. This is clear from what has gone before.

Here, therefore, is another reason for fixing on 1000 cubic feet of space as the ideal. There are others still. As has been said, air contains moisture, and though moisture in small quantities is an advantage, even a necessity, for breathing purposes, in excess it is a disadvantage.

Just as the human body gives off carbonic acid, so also does it give off moisture. Part of this comes from the lungs with the expired air: part comes from the skin in the form of perspiration evaporated by the heat of the body, and the heat of the air in the space. Because it comes from the body this moisture is apt to be objectionable, and, like the carbonic acid gas, it must not be allowed to mix too freely with the air to be breathed or remain in the space. If the space is sufficiently large and the flow of air is good it is soon dissipated.

That is another reason for fixing 1000 cubic feet as a good space, and 3000 cubic feet as a minimum supply of air. Here is another. According to some observers, carbonic acid gas is not at all the substance which causes discomfort or even poisoning in badly-ventilated rooms. With the breath, they say, dirty organic matters are given off. These are smelly, everyone has smelt them, and dangerous, but if they are exposed to pure air they are destroyed. Good space and a good flow of air are necessary for these: a space of 1000 cubic feet is the limit.

Still another set of observers blames the heat of the air more than anything else. Heat is largely given off by the body, and unless it is dissipated it leads to an increase in the amount of moisture in the air to such an extent that eventually it becomes unpleasant to breathe. Further, if the air continues to take up moisture there comes a time when it can take up no more, and the action of the skin and other surfaces of the body which give off moisture are interfered with. This leads to a throwing out of gear of the various organs of the body and consequently to trouble. This is a most fascinating view, and it is one which has many adherents.

No matter what the explanation of how the trouble arises may be, there is no doubt that it does arise, and the only way to prevent it is by giving a human being a sufficiency at least of space and of air, and on all grounds 1000 cubic feet of space and 3000 cubic feet of air may be taken as satisfactory amounts. That as much is allowed is unfortunately often not the case. In dwellings, least of all, is the limit of 1000 cubic feet of space regarded. Frequently, indeed, it is impossible to give this amount, and, though theory suggests that it should be insisted upon, practice requires that the coat shall be cut according to the cloth.

A minimum much lower has, therefore, been more or less fixed by law for the protection and government of the less fortunate in the state, viz. 300 cubic feet per head in a sleeping room. This means that there is a diminution in space allowed for movement of the body; that the air must be changed at least ten times per hour if it is to be kept pure; and that the 3 feet per second of flow must be exceeded and draughts produced if the air is to be changed. As a fact, of course, there is nothing like a change of the air ten times in the hour produced. More often than not, too, the 300 feet minimum is not regarded, and the necessity for more frequent changing arises.

Overcrowding.—When the 300 feet minimum is not provided, overcrowding occurs, and the person who is charged with overcrowding is in effect charged with allowing himself and his dependents less than 300 cubic feet of space: exposing himself and them to the risks attendant upon having the air changed more frequently than ten times per hour —itself far too rapid a rate—or alternatively of being poisoned, it may be, with carbonic acid gas, or by the organic matters, heat, or moisture given off from their own bodies.

Contamination of Air.—Though the occupant of a space himself is an important factor in the contamination of the air we breathe, there are other factors present, some of them necessarily, which are of no small importance in this respect.

Amongst these are, first of all, the heating and lighting agents, and if these are not carefully chosen and carefully watched and guarded against they may lead to a considerable amount of contamination and consequent trouble. It has already been pointed out that the usual source of carbonic acid gas is the burning up of carbon or substances containing carbon in the presence of oxygen. If it is desired, therefore, to keep the amount of carbonic acid gas in a space as low as possible, care will be taken to avoid burning such substances.

Unfortunately, however, because the commonest methods of producing light and heat are precisely by the burning of carbon or carbon-containing substances, a problem of some difficulty has to be faced.

The Coal Fire.—The carbon most commonly used for heating, as is well known, is coal, and in connection with heating there is probably no agent, with the possible exception of its derivative, coal gas, so greedy of oxygen or more certain to produce carbonic acid gas. It is true, of course, that if burned in a properly-constructed grate the bulk of the gas produced passes away up the chimney, but some of it escapes into the room and leads to contamination.

In other ways than by throwing out some carbonic acid gas and by drawing away oxygen a coal fire gives rise to contamination of the air. The use of coal and the burning of coal are always associated with dirt, and no air which contains dirt can be regarded as an uncontaminated air. As will be explained, one of the chief objections to particles of dirt in a room is that they float about and carry germs with them. The dirt from a fire serves quite well for this purpose, and is therefore objectionable.

These are the main objections to a coal fire from the air-contamination point of view. In dealing with heating, other objections as well as certain advantages possessed by it will be mentioned.

The Gas Fire.—Next to the coal fire as an air contaminator, possibly even ahead of it, comes the gas fire. One of the intentions of those who first recommended coal gas as an alternative to coal as a heater was to reduce the contamination of the air by means of dirt. That a gas fire is much cleaner than a coal fire, or any other form of fire in which solid carbon-containing fuel is burned, cannot be doubted. But, as has been shown, dirt production is not the only objection to a coal fire, and a gas fire, merely because it gets rid of the possibility of dirt, has not overcome the whole difficulty.

Some objections to the coal fire are shared by the gas fire. It is as greedy or even more greedy of oxygen, and it leads to the production of as much if not more carbonic acid, and in addition, other objectionable substances. If the gas stove is properly constructed, properly situated, properly lighted, properly adjusted, and provided with a proper chimney, the difficulty with the carbonic acid gas can be overcome. At the same time difficulty from other highly-objectionable substances produced during the consumption of gas or resulting from its incomplete combustion will not be experienced.

Unfortunately, however, gas stoves, either cooking or heating, do not always comply with these conditions. Too often those who have such stoves fixed and those who fix them overlook the necessity for the exercise of care in dealing with such coal gas, an agent dangerous both while unconsumed and while being consumed. Too frequently the stoves are so placed that the gas is burning absolutely in the air which is to be breathed, and are unprovided with any vent to take away the products of consumption.

Even when properly constructed and situated, if not properly lighted, gases are produced, many of which are more objectionable and more dangerous than carbonic acid gas.

These, as most people who have been in a room with a badly-lighted gas fire will agree, seem to fail always to pass away up the chimney, and are apt to give rise to most distressing symptoms.

Though the chimney of a gas stove, as indeed that of a coal fire, is intended to carry away all objectionable gases, not infrequently the current upwards does not take place, and a back draught into the room results. In the case of the coal fire, what returns is a certain quantity of carbonic acid gas and unconsumed gases, along with smoke and soot. The presence of the latter leads to the detection of the back draught and the taking of preventive measures.

With the gas fire it is different, and that anything is wrong may not be detected till considerable quantities of the various unconsumed and other gases have been driven into the room.

Further reference to gas fires will be made later, but in the meantime these objections must not be overlooked.

Closed Stoves.—Coal and its derivatives, coal gas and coke, are sometimes used not in open fires, but in closed stoves. Chiefly what is to be feared from such appliances, more especially those in which coke is consumed, is contamination of the air by carbon monoxide. This is a very poisonous gas, and since, like carbon dioxide, it has no smell, its presence is usually not detected until it has given rise to symptoms in the person who has breathed it.

These symptoms are headache, a feeling of tightness across the chest, giddiness, fainting, and impairment of health, if small quantities are inhaled for any length of time. Comparatively small quantities are capable of causing death, and there are a number of instances on record in which persons who have lived or worked in rooms heated by badly-constructed or improperly-used stoves have suffered in health as a result of breathing the carbon monoxide produced.

If the stove is sound, well made, and well used, such risks need not arise, but apart from contaminating the air, the stove is apt to interfere with it in other ways. Chiefly this interference is in the nature of a parching, and as a result the air becomes unpleasant and even injurious to breathe. An explanation of this parching of the air, and how and why it is to be avoided, will be offered under the heading "Heating."

Radiators.—In order to avoid the undoubted objections which there are to fires and stoves on the score of cleanliness and air contamination, many people prefer heating by means of radiators—steam, hot water, and electric.

In this country the two first named are rarely used in dwelling-houses, though there are many who would like to see them introduced, partly because, in addition to being economical of fuel and labour—only one central fire being required—by their use the temperature required is easily obtained and maintained. The objection offered to them is that they are cheerless, and the majority of people in this country prefer a visible heat.

To meet this requirement, and at the same time to confer those advantages of cleanliness, saving of labour, and freedom from contamination of air which are so desirable, the third form of radiator, namely the electric, was introduced. Without hesitation it may safely be said that it fulfils its functions admirably. Glowing in their sealed tube, the electric wires take nothing from the air of the room, add nothing to it. Neither gases nor dust are produced, and, so far as cleanliness is concerned, electricity must be regarded as standing absolutely alone.

There are objections, of course, to its use, but if any have been made on hygienic grounds no serious view need be taken of them. Electric and other forms of heating fall to be considered later, and such objections as there are will be referred to then.

Ventilation of the House.—All that has been said in previous pages with regard to ventilation has referred mainly to that matter in relation to rooms. But the importance of ventilation in connection with the house as a whole must not be lost sight of. There should be no part in any house—room, lobby, staircase, and so on—which it is impossible to get flushed out with air. Air should not be allowed to collect anywhere; there should be no pockets of air; there should be a continuous flowing through.

Through Ventilation.—If this is to be obtained both inlets and outlets must be provided. The house should be so placed that it has an open space on at least two sides—at the front and at the back—and on these two faces there should be openings—doors or windows—or preferably both. If these are provided, and they are kept open as much as possible, ventilation will be brought about; fresh air will travel through the house from the one opening to the other, and will find its way throughout the house, flushing out the stale air as it goes, and leaving clean air in its place.

Back-to-back Houses.—In certain parts of England a form of dwelling not uncommonly seen is what is known as the "back-to-back house." In this, as the name suggests, the houses are built so that they are joined together at the rear, one back wall serving for both. As such houses are commonly built in rows, none of the houses except those at the ends have any open space in connection with them except at the front. None of them have any back garden or yard, and not uncommonly, opening directly from the street, they have no front garden either.

The result of such construction is, of course, that there is no blowing through of fresh air; the only outlets possible for the air that enters either at the front door or the windows are the chimneys. Such a state of affairs, besides being eminently undesirable, cannot be defended on health grounds, and it is greatly to the credit of the Government of that year that in 1909 a law was passed prohibiting the erection of "back-to-back" houses after a certain date.

In self-contained houses it is not infrequently recommended that in order to allow of the escape of air which, because it is warm, has risen from the lower parts of the building to the top, through the well of the staircase, a skylight or ventilator should be provided in the roof over the top floor. At any time skylights are exceedingly unsatisfactory things; they are very apt to be neglected; they are commonly difficult to open and are consequently rarely opened; they are difficult to get at to clean, and they are often leaky.

The idea of providing a roof ventilator is better, and on theoretical grounds its introduction may be recommended. As a matter of fact, however, if the house is a "through" one, and has openings back and front on all floors, the likelihood of much of the warm air from the lower floors reaching as far as the top is exceedingly small.

In the case of tenements and blocks of flats, where the houses are entered from common passages or landings, the necessity for providing these with through ventilation must not be overlooked. The separate houses draw much of their air from the space upon which their front doors open, and this should be as much like the air outside as possible. The passages should, as far as possible, communicate with the open air, and should have openings to the outer air. In addition to allowing fresh air to enter, these will permit daylight to come in, and tend further to increase the impression that the passage is one with the space outside.

In large blocks of flats, roof-lights or ventilators are commonly introduced, and are usually necessary for purposes of ventilation and lighting.

Tests of Ventilation.—A considerable number of scientific instruments and methods have been devised for the purpose of discovering as to whether or not ventilation in rooms and houses is satisfactory and sufficient, and the air pure. The majority of these are complicated, and call for no small amount of skill and knowledge in their employment. To work out and properly understand the results obtained by the tests also requires skill and knowledge, not usually possessed by the general public.

Fortunately, it is not necessary always to apply tests or to work out chemical and mathematical problems in order to arrive at a proper conclusion. A sufficient indication is readily obtainable from the nose and from the general sensations experienced.

The nose, especially when its possessor has just come from the outer air, can readily detect the fact that there is something wrong with ventilation. The air, contaminated largely by the exhalations from the lungs of the occupants and the emanations from their skins, clothing, and so on, has an unpleasant odour. It feels close and heavy, and far too warm to breathe. It oppresses the lungs, and gives to the skin the sensation of being heavy and damp.

The presence of smelly materials, of too much heat, and too much moisture are easily detected without any apparatus. When they are detected the conclusion may safely be arrived at that ventilation is defective, and that the air is not good to breathe. If required, other tests should be entrusted only to an expert. In dwelling rooms, however, they are unnecessary if the senses are properly used and the indications they give acted upon.

Heating and Ventilation

The relation of heating to ventilation is generally recognised, and though perhaps less important in the dwelling-room than elsewhere, the existence of this relationship must always be borne in mind.

The basis of the relationship is a physical one, and is mainly dependent upon the following facts, viz. that heated air is lighter and bulkier than cold air, and in a closed space, such as a room, tends to rise and to escape from the space in which it is confined.

Evidence of these facts is easily obtainable in any occupied room by anyone who cares to mount near to the ceiling, or to watch what happens when a window is opened at the top, to let out smoke from a smoky chimney. The sensation of draught felt round the feet by those sitting close to a fire is dependent, to some extent, upon the tendency of cold air to remain near the floor level, though mainly it is caused as a result of the air heated by the fire passing away up the chimney and colder air rushing forward to take its place.

In the reference to this phenomenon there is contained another to a further phenomenon produced as a result of heating of air, viz. circulation of air.

Circulation of Air.—When hot air within a space rises, expands, and escapes through the top of the window or up the chimney, as the case may be, a vacancy is naturally produced.

Following the well-known law that a vacancy cannot be permitted in nature, it is almost immediately filled up. This is brought about by cold air which finds its way into the space, usually from outside the space, to do so. In its turn this cold air becomes heated, rises, expands, and overflows, and its place is taken by a further supply of cold air.

And so it goes on, and in this way a circulation is kept up between the inside and the outside of the space.

Within the space also, however, circulation takes place, because when the hot air rises not all of it escapes; in the upper reaches part which remains gets cooled, and becoming cooled presses down to a lower level, gets heated, and rises again. This time it may escape, but in any case it takes part in the circulation.

The whole aim of ventilation is, in fact, to encourage circulation of air in the home, and though there are other means of bringing it about, *e.g.* by stirring up the air, *e.g.* by fans, electric or other, or punkahs, as in India, one of the chief determining factors of circulation is heat.

Within the space, therefore, proper regard must be paid to heating, because it is a factor, and in choosing a heater this must be considered.

Ventilation Openings.—In addition to this factor there are others, however, to be discussed in connection with air circulation. These are mainly the outlets for the expanded hot air and the inlets for the cold air.

In dwelling rooms the openings which usually serve these purposes are the ordinary ones, the doors, the windows, and the chimneys. Of these the chimneys act as outlets, in the manner described, the doors act mainly as inlets, and the windows sometimes as the one and sometimes as the other.

Under ordinary circumstances and in ordinary living rooms these, if properly used, fulfil all requirements. If properly used they are capable of so acting in relation to circulation of air or ventilation that neither discomfort, inconvenience, or ill-effects are produced.

Sometimes, for one reason or another, additional inlets or outlets are introduced leading from or to the outer air. As an inlet, what is known as a Tobin tube is erected in the room. This is merely a long box with two ends, one on the outside of the wall of the room partly closed by an iron grating, the other inside the room at a level of five or six feet from the floor, and fitted with a lid which can be opened or shut as required. The reason for placing the opening so high is to ensure that the entering air shall acquire a little warmth before it is breathed.

As an outlet sometimes an opening is made from the room through the wall into the chimney. This is made usually near the ceiling, is protected with an iron grating, and provided with a thin screen of a material known as mica. This is hung on hinges, and is so arranged that if there should be a draught down the chimney it immediately shuts, opening only to allow currents of air to escape from the room into the chimney.

To obviate the necessity of continually opening and shutting the window when modifications in its services in relation to ventilation are required, sometimes special panes, capable of being opened or shut by pulling a cord, are introduced.

Again, sometimes the window is fixed so that it is more or less open at the point where the lower part of the upper sash meets the upper part of the lower sash. This is brought about by fixing temporarily or permanently a piece of wood of the desired height across the whole width of the window opening and bringing down the lower sash of the window upon it. Through the space between the sashes air can enter or leave, usually the former.

Though there are many other contrivances which may be employed, these, especially the last, are the commonest and simplest.

Under ordinary circumstances it is the degree of warmth within the room which leads to these inlets and outlets performing their functions. Just in the same way as circulation of the air inside the room, the rising of the hot air, and the falling of the cooler air, will become sluggish or almost cease if there is no movement of any of the bodies in the room and the temperature at the lower parts approaches that of the upper, so, when the temperature outside is nearly the same as inside and the air is not moved artificially, interchange is lessened.

Sources of Heat.—The heat which has been shown to be so important a factor in bringing about movement of air is provided apart from the fire or heating agencies to some extent by those employed for lighting and by the living occupants of the room. The amount of heat which comes off from a living body is considerable, and is capable of raising the temperature of the air which surrounds it an appreciable number of degrees in an hour. This heat is capable also, of course, of inducing the air to circulate. Its effect in this direction is, naturally, slight compared with other agencies.

The amount which can be put down to the lighting arrangements depends upon the agent employed, those which act by combustion—gas, oil, and so on—adding very much more than electricity, for example, which gives off very little heat. The agencies which are introduced for no other purpose than heating or for such purposes as cooking, are those which produce the greatest amount of effect.

Radiation and Convection.—Heating of a room, no matter what the agency employed, is brought about by means either of *convection* or *radiation*. By convection is meant the conveyance of heat by heated particles, such as particles of air, from one part of a room to another. In radiation the heat rays pass from the substance giving them off through the air, to be transformed into heat when they reach some solid object, such as a piece of furniture or the walls of the room. From these heated objects a certain amount of convection takes place, the particles of air coming in contact with them becoming heated and carrying away heat with them in their movements. The movements set up in the air in this way are called convection currents.

Of the two forms, radiation is generally regarded as the better, because the heat rays passing through the air do not directly affect it, and do not dry it up by removing the moisture from the particles. In the case of convection, the particles of air themselves, being warmed by contact with the heated surface, undergo at the same time a considerable amount of drying. A dried air, as has already been explained, is less pleasant, because in order to replace the moisture which has been removed, it withdraws it from the skin and surfaces of the breathing apparatus with which it comes in contact, and so gives rise to discomfort and even to increased risk of attack by germs of disease.

Though it is usual to talk of various forms of heaters as definitely radiators or convectors, it is rare to find one which acts only by radiation or only by convection. A heating agent may act mainly by radiation or mainly by convection, but not entirely.

Coal Fires.—Coal fires are typically radiators, and it is, partly at any rate, because they provide the advantages of radiation in connection with non-drying of the air that they are still the favourite form of heaters in this country. In addition, of course, they possess the advantage of cheerfulness, and they are companionable. A fire that is well alight is always changing; it provides something for the idle eye and also for the idle hand of the person who sits by it.

But cheerful, companionable, and even to some extent comfortable as it is, the fire has a number of objectionable features. It is inconvenient, it is wasteful not only of air but of fuel and of heat; it is dirty; it is dangerous; and it provides its heating effects irregularly.

The fact that a fire is inconvenient does not make it objectionable from the health point of view, except in this respect, that an inconvenient thing is a worrying thing, and worry on health grounds is certainly to be avoided. The waste of fuel brought about by a fire is more a question of economy than of health, as is also to some extent the matter of waste of heat.

Waste of air is calculated to produce some effect on health, however, and calls for further mention. It has already been explained that because of the tendency of heated air to overflow the space in which it finds itself a certain amount passes away up the chimney, and to take its place cold air rushes in. In connection with ventilation and air-circulation this is an advantage, because the cold air which enters, in addition to being cold, and therefore stimulating, is generally fresh, and contains the oxygen necessary to the life of the occupants of the room.

Owing to the position occupied by the fireplace, the air which is drawn in is pulled down to such a level that it is practically not made use of at all by the occupants. Moreover, it comes at such a speed that no opportunity is given of using it. Because of its speed, too, the fact that it is cold is not infrequently made apparent to the individuals seated between the point of entry and the fire, a distinct sensation of draught around the feet being produced. That this is so can, of course, be readily detected.

Practically all that the bulk of air which is drawn in by a fire does, as a matter of fact, is very little more than to provide oxygen for the combustion of the coal and take the place of other air which has passed away up the chimney. Because this, and also to assist in its own combustion, is the fate of much of the air that the fire brings into the room, is one reason for calling it wasteful of air.

Wasteful in ventilation would perhaps be a better description, but since it is exceedingly doubtful if a fire, or for that matter, any form of heating apparatus used in connection with a fireplace and chimney, owes much of its value to the fact that it draws air towards itself and so up the flue, the former expression will serve.

That a fire is dirty is admitted by everybody. It is dirty to make, it is dirty to keep going, and it is dirty while going. Because it is dirty it is an air-contaminator, and therefore objectionable from the health point of view, the dirt particles, and with them organisms, possibly of disease, passing into the body with the air breathed.

If there were no other objection to a fire than that it was dirty, there would be sufficient grounds for condemning it. But this is not the only objection. Some have already been given, and there are others to follow.

The dangers that arise from open fires have been demonstrated over and over again. Innumerable outbreaks of fire which have led to the destruction of property and to great loss of life have been traced to open fires. The number of children who have lost their lives through contact with open fires is also very large. The fireplace without a fireguard is notoriously one of the elements in the causation of child mortality. The open fire which sets flannelette alight and leads to the envelopment of the wearer of the mat rial in a sheet of flame is another. That there are these objections to it must certainly be added to the indictment against the fire.

That a fire heats irregularly must have been noticed some time or other by everyone. Sitting in front of a fire, practically the only part of the body heated is that exposed to the rays. That away from the fire receives mainly the currents of air drawn to the fireplace, sometimes at a great pace and so is apt to be considerably cooled. While this may be an objection on the score of health, it is a much graver one on the score of comfort, and as comfort is practically the only thing considered by the average person in relation to a heating agent, it probably carries as much if not more weight than any of the others. The irregularity in heating which results from the variation in size of the fire is also noteworthy. With a hand-stoked fire it is practically impossible to keep up a uniform temperature, and the room is, inevitably, sometimes too warm, sometimes not warm enough, both of them—especially, according to some, the former—conditions to be avoided.

To sum up with regard to fires it may be said, that the chief objections to them on health grounds are that they are dirty, and the dirt they produce contaminates the air and aids in the spread of germs; they set up "draughts" and lead to excessive cooling of certain parts of the body; they are dangerous, and may easily cause damage to or loss of life. The relation of the fire in the room to the smoke nuisance, and the effect which this produces on health by contaminating even the outside air and interfering with sunshine, should also be borne in mind. Against these—still on health grounds—are to be set the following: that fires do not dry the air, and that they do not, under ordinary circumstances, add objectionable gases to the air.

The health objections, counterbalanced even by the advantages, are almost enough to lead to the banishment of the fire. When these are added to other disadvantages, inconvenience, and so on, the grounds are ample, and having regard to the fact that there are other agents possessing fewer disadvantages and a number of distinct advantages of their own there seems little reason why it need be retained. As already said, the reasons why it is still used are that it is cheerful and companionable. Also, of course, there is the objection felt by a great many people to change of any kind.

Stoves.—Stoves burning coal, coke, or oil are not amongst the heaters which possess fewer disadvantages than the open fire. Nor do they possess any particular health advantage of their own. Coal and coke stoves are cheaper, but they are cheerless, and most of their heating is done by convection, with the result that the air is apt to be dried. That there is apt to be contamination of air by gases has already been noted. The stove, if it can be avoided, should not be used.

Gas Fires.—The modern type of gas fire is mainly a radiator, though a great part of its work is done by convection. This is why the air of a room heated by a gas fire has a dry feeling, and why it is usually recommended that a vessel of water should be placed somewhere near the fire.

Like the ordinary coal fire, the gas fire produces its heat by combustion; it differs from it in that it produces no dirt; under ordinary circumstances gives nothing to the air but heat, though it removes from it considerable quantities of oxygen and of moisture. In relation to ventilation it acts in much the same way as the coal fire, drawing large volumes of air towards itself, partly to supply its own needs, partly to pass up the flue.

Though, if properly made, fixed, ventilated, and used, a gas fire need add little that is objectionable to the air, it is undoubtedly the case that there is often carelessness in making, fixing, and ventilating. Having regard to the fact that this carelessness may cause tremendous danger to life, to a great extent because of the contamination of air, which results from the escape into it of poisonous gases, carbon monoxide, carbon dioxide, and so on, such carelessness may almost be classed as criminal.

As to the proper use of the gas fire, this also is an important matter. One of the great difficulties with the gas fire is that it is so easily wrongly used. So many people are nervous about lighting such a fire. They dread the occurrences of an explosion, and their dread is often added to by the loud reports which so frequently occur when the gas catches alight.

Because of this dread there is always a tendency to light a gas fire hurriedly; to stand as far off from it as possible, and to escape from its vicinity with all speed. As a result the lighting is wrongly done; the flame, instead of burning clean and blue as it ought to do, burns yellow and dirty, and objectionable, dangerous, and foul-smelling gases pass back into the room.

These difficulties in connection with the gas fire constitute one of the great objections to its use in ordinary living rooms. To them must be added some which are hygienic and some which are æsthetic.

One of the hygienic objections has been already mentioned, namely, the drying of the air which is produced. The troubles likely to be caused by the dryness of the air have been to some extent indicated. If the skin and the other more or less exposed surfaces of the body—the inside of the nose, throat, and breathing passages generally—are to do their work properly, they must be kept more or less moist. Under these surfaces there are arrangements for supplying them with moisture, and always there is a sort of give-and-take going on between the surfaces and the air which they meet. If there is just the right amount of moisture in the air, the skin and so on go on comfortably, giving off small quantities of fluid. If there be too little they give off quantities which they cannot afford: they become dry and uncomfortable. If there be too much in the air, they give off none and are again uncomfortable, even waterlogged.

In either of the two last cases they are not allowed to be normal and healthy. Anything, therefore, which either makes the air too dry or too moist for the body is to be avoided.

The drying effect of the gas fire on the air of a room is easily noted, and must have been noted by all who have been compelled to enter a room in which such an apparatus is used. The rapidity with which any water placed near a gas fire disappears is little short of a revelation.

Air heated in the way it is heated by a gas fire will draw moisture from any source. It will take it, and does take it, as readily from the human body as anything else. Of the surfaces deprived of moisture, probably the windpipe and lungs can spare it least. Drying of these undoubtedly leads to a lowering of resistance and a consequent liability to such diseases as bronchitis and pneumonia.

The chief æsthetic objection to the gas fire is its cheerlessness. In the heat which it gives off there is no cheerful element because it damages the air, takes away its quality of stimulation by drying it up. In the apparatus which sends out the heat there is no appearance of cheerfulness either. The claim made for the gas fire is that it produces no dirt, and every line of the apparatus in which the fire is made supports this claim. But in a heater something more than this is wanted. Except in the kitchen the fire is lighted only because of the comfort it affords. Everything else, and rightly so, because there are other ways of bringing them about, is secondary.

The absence of cheerfulness is largely due to the fact that in this form of heater the radiating qualities are not sufficiently definite. There is no sparkle about it, commonly only a hollow roar more or less loud. There is never that cordial invitation to come and sit by it that is given by the coal fire.

To sum up with regard to the gas fire: some of the objections urged against the coal fire it also possesses; it differs from the coal fire in that it does not contaminate the air with dirt; it may, and often does, contaminate it with objectionable gases; it dries the air and is prejudicial to health on this account; it not unfrequently overheats the air; it is easy to light a gas fire wrongly and so produce a dirty yellow heavy flame instead of a clean blue one; it is more convenient than a coal fire, but its use is associated with greater risk, *e.g.* of escapes and explosions; it is a cheerless fire.

No less than a coal fire, the gas fire is a possible source of outbreaks of fire and of damage to life and property. In nurseries and sickrooms, for which many recommend it, that there are risks of fire with the gas fire should not be forgotten.

On health grounds the objections to the gas fire depend mainly upon the drying and overheating and possible contamination of air.

Drying means loss of moisture by the skin and breathing apparatus and lowered resistance; overheating means loss of brightness in the air, loss of movement in the air, and loss of stimulation of the skin by the moving air.

Contamination of air by gases, unfit to breathe, such as carbon dioxide and monoxide, means discomfort, headache, lowering of health, and, if the amounts are excessive, even death.

Hot Water and Steam Radiators, &c.—In this country these are so seldom used that really little need be said with regard to them additional to what has already been said. All of them heat chiefly by convection, and therefore dry up the air. With them there is a risk that the chimney will be blocked up and its aid, such as it is, as an air outlet lost.

Electric Radiators.—Heating by means of electricity, still, comparatively speaking, on trial, is standing that trial extremely well. Capable of giving all that any other heating agent—coal, gas, &c.—can give, it has this advantage that it gives it free from any of the disadvantages possessed by the others. The heat produced does not depend upon combustion within the room to be heated, therefore nothing is taken from the air and nothing added to it either in the form of dirt or objectionable or harmful gases. The heating taking place as a result mainly of radiation, there is no drying of the air and no objection on this score.

From the point of view of purity, that is to say, of hygiene, electricity for heating is practically the ideal. From the æsthetic point of view, also, it has distinct claims, the glow given off being distinctly cheerful, genial, and inviting.

Its advantages from the domestic point of view in connection with comfort and convenience are also considerable. For convenience, of course, electricity is unequalled, the electric fire being particularly convenient inasmuch as it need not take up a fixed position but can be moved about from place to place.

Against electric heating practically the only objections ever urged have been with regard to cost and in relation to assistance rendered to ventilation. As to the former, it is unnecessary to say much here, the chief concern being with regard to health. It may be pointed out, however, that it is rather more than doubtful that heating by means of electricity is not as cheap, if not cheaper, than heating by other agencies. Also there is every likelihood that as time goes on it will be greatly reduced in price. All that is required is an increased demand, and because of the advantages which electricity presents, and its freedom from objection on health grounds, that increased demand is certainly warranted.

One point in relation to cost is this, that it is less wasteful of heat than any other of the agencies. The bulk of the heat produced passes into the room and not away up the chimney. It is because of this that the objection has been urged to electric heating, that it does not so greatly favour ventilation.

From what has been said in previous pages it will be gathered that this need not be regarded as any very great disadvantage. The drawing in of air merely to use it in the combustion of the heating material or to rush it up the chimney cannot be considered as any very important part of ventilation. The pull on the air is mainly low down, and the current which sets towards the chimney is of cold air, which might be useful to the occupants of a room partly because it is fresh, partly because it is cool. Practically, however, they get no advantages from it.

The electric heater draws very little air towards itself, it is stated, and sends very little up the chimney. On the whole this seems to be an advantage rather than otherwise. It produces heat, most of which it sends into the room, and with any heater it is the heat which is sent out which is the important part. It is that which leads to the air movements within the room and a great part of the interchange which takes place between the inner and the outer air.

If the air inlets and outlets, ordinary or artificial, in a room are properly manipulated, it is possible practically to disregard the assistance to be obtained directly from the placing of a heater of any kind in the fireplace. In effect, so far as the fire simply is concerned, one thing is as good as another. It is the advantages and disadvantages in other respects which have to be considered.

The heater which possesses fewest disadvantages is undoubtedly electricity. On the health side it has none, and by those to whom health is the chief concern—and it should be the chief concern of everybody—it is the heater to be chosen.

Lighting

It is almost unnecessary to refer to the importance, from the health point of view, of proper lighting of dwelling-rooms.

Life without light is almost insupportable, and there is practically no living creature that can survive without it.

One of the exceptions is, of course, germ life and bacteria of all sorts; those that produce disease as well as those that do not, grow and thrive best in its absence.

Because germs do object to it and are least active where it is plentiful is one of the reasons for so strongly recommending its admission to dwelling-rooms in as large quantities as possible.

Another reason is, of course, that it is almost impossible to have a well-lighted room other than a clean room.

Dirt which is seen stands a poor chance of being allowed to remain. The room which is likely to be dirty is the dark room. People who talk and write about health do not use the words "dirt, darkness, and disease" together only because they come easily. The association between the three things the words represent is very definite: dirt and darkness are very commonly found together, and so are dirt and disease and darkness and disease.

Apart altogether from producing diseases to which distinct names may be given, darkness and insufficiency of light are undoubtedly capable of leading to damage to health.

Mainly through the eye all the senses are stimulated by the light which is seen and a feeling of well-being is produced. In addition, however, the rays that go to make up the light produce other effects as well. Why this should be is difficult to explain, but that the effects are produced no one can possibly doubt.

Natural Light.—The light which is most appreciated and which is most beneficial is daylight, and more especially sunlight.

In every house the room in which the light is most plentiful is always the favourite room. In looking for a sitting-room, that usually hit upon is the one which looks towards the sun, and though housewives may complain that the colours of this, that, and the other furnishing of the room are bleached by the sun, it is only rarely, in this country at least, that really serious steps are taken to keep the rays out. Moreover, in building houses, architects always seek to so place them that every room shall be so situated that at some part of the day a certain amount of sun is obtained.

When compelled to erect the building otherwise than as described, it is noteworthy that it is only the rooms which are to be used for other purposes than for living that are placed on the sunless sides, viz. those looking more or less to the north.

Apart from such apartments as the larder, food stores, and such like, only rooms that are used occasionally should face in this direction. The dining-room, for example, may be on the north side: never sitting or drawing-rooms. These and bedrooms should face the south or west. A directly easterly direction is not so good as one which has a considerable amount of south in it.

The windows in all rooms, except possibly those facing north, should be as large as possible. Sometimes an attempt is made to state the relation to which the size of the window should bear to the size of the room, and even in some cases this is laid down in laws and regulations. In some it is stated, for example, that the window opening must in no case be less in area than one-eighth or one-tenth of the floor area. In schools it is recommended that the area should equal one fourth to one-sixth of the floor space, and in hospitals that there should be one square foot of window space to every forty cubic feet of air space.

That such rules have been laid down indicates the importance attaching to size of window. The only objection to too large an amount of window space is that it may lead to the air in the room being cooled too much and to difficulties being experienced in properly heating and circulating the air. The draughts which are sometimes felt near windows are due to the cooling of the air in the room which has come in contact with them, and not to any current of air from outside at all.

Within reason, and bearing the measurements given in mind, the window should be as large as possible, and should be carried up as close to the ceiling and down as close to the floor as convenient.

Being primarily a lighter, it should be so constructed that it offers no obstruction to light entering. The panes, within reason, should be as large as possible.

Window sashes which are divided up too much are bad; a window consisting of a number of small panes, besides being difficult to keep clean, does not let in nearly so much light as one made up of one large pane.

The larger the pane, of course, the more difficult the window is to open and shut, but this is a difficulty easily overcome by proper hanging.

Proper hanging, as a matter of fact, is essential in all windows, because, as they are to be used in connection with ventilation and act best when open, the more easily they can be opened the more likely they are to be used. To the possibility of keeping the window more or less open all the time, reference is made in the chapter on Sleeping Rooms and the method of carrying it out is there described. The fittings which may be affixed to windows with the object of improving ventilation are considered in that chapter also.

Because curtains are liable to reduce the amount of light entering through the window, the greatest care should be exercised in connection with the choice of these.

The tendency at the present time is all in the direction of simplicity in this matter. In many cases the housewife is satisfied with casement curtains which act, when pulled across, as blinds in the evening when the interior of the room is lighted up.

This is a good arrangement, as it tends to reduce the number of hangings about the windows, to which there is another objection than that they interfere with lighting, viz. that they collect dust, and, when shaken, add that dust to the air of the room.

The kind of glass to be used in the windows may just be mentioned. Under ordinary circumstances plain glass serves quite well; in noisy neighbourhoods not uncommonly plate-glass is fixed, and certainly serves well to keep out noise. Ribbed glasses, which, because they split up the light rays and diffuse them and so improve lighting, are sometimes introduced if there is a risk of the room being overlooked. In a living room these are undesirable, as they are depressing, and though they improve the lighting, give the occupant, because he is prevented from seeing what is outside, a feeling of being shut up which is most unpleasant.

Artificial Lighting.—Even at the present time the majority of the agents, *e.g.* gas, oil, and candles, used for lighting purposes depend for their illuminating properties upon combustion. The only agent which does not is, of course, electricity, which produces light by throwing thin filaments of metal enclosed in an airtight glass bulb, into a condition of incandescence.

With electricity there is no combustion of any kind at the point where the light is produced.

With the others there is, and, as has already been pointed out when speaking of heating, this means not only that oyygen, the importance of which in connection with life is well known, is being used up, but that carbonic acid gas, a substance generally considered undesirable from the health point of view, is produced.

In the case of the fire it was indicated that the substance being burned drew in for itself the bulk of the oxygen used up, and that, as the burning took place under a chimney, most of the carbonic acid gas disappeared up the flue.

When gas, oil, and so on are burned with the object of producing light they burn directly in the atmosphere of the room they are required to light, and the oxygen they use is part of that provided for the occupants of the room. The burning taking place in the room, and no flue being provided for the removal of the carbonic acid gas, it passes off and mixes with the air to be breathed.

With regard to oxygen consumed, it has been calculated that one ordinary gas burner is capable of fouling in an hour as much air as five or six adults. With incandescent mantles the fouling is somewhat less, but a considerable amount of oxygen is used up. Candles and oil lamps use up even more than gas.

In addition, all these illuminants produce dirt and heat, which they add to the atmosphere.

The dirt produced is in the form of soot, the largest amount coming from candles and lamps. Almost as much is given off by the naked gas flame, and though the use of incandescent mantles in connection with gas somewhat reduces the amount of dirt produced, it is only necessary to examine the ceiling above the gas bracket to prove that considerable quantities are given off even under these circumstances.

So far as heat is concerned there is little to choose between the oil lamp and the candle: each produces a considerable amount. The gas flame also heats as it lights, the incandescent again less than the naked flame.

Having regard to what has already been said as to the effect of overheating of air in relation to comfort and health, the fact that these illuminants produce heat is an important one, and must not be lost sight of.

Producing at least one poisonous gas, viz. carbonic acid gas, producing dirt, and adding heat that is unnecessary in a position where it is not desired, oil, candle, and gas flames cannot be regarded as satisfactory from the hygienic point of view. From the lighting point of view they are also open to objection, inasmuch as they are, none of them, unless very carefully attended to, quite steady. They may, as is well known—though this can to some extent be prevented by globes—be blown out by the wind.

In the case of the oil lamp and candle this is merely an inconvenience: with the coal gas it is a danger. The risks attending an escape of coal gas into the air of a room are chiefly that harmful effects, slight or serious according to the amount of gas present, are produced in the person compelled to breathe it. If the amount is small, the individual may show merely the effects of irritation of the windpipe and lungs, viz. coughing; if the inhalation of small quantities is continued for any length of time, headache and weakness are produced; if large quantities are taken in, the person falls unconscious, and may, if assistance is not speedily given, die of suffocation.

The majority of these symptoms are due to the fact that coal gas contains no oxygen, but consists of a number of gases, all of them poisonous. Fortunately some of these gases are irritating, and also have a distinctive smell, which sometimes, though not always in the case of babies and young children, serves to give warning of its presence.

Because it is an explosive gas it is inadvisable to search for the source of the escape with a naked light. Any room in which there is a smell of gas should be first thoroughly ventilated before any search is undertaken.

The possibility that it may escape from the pipes in which it is carried must always be an objection to the use of gas in a dwelling-house: the fact that it may give rise to explosions must also be borne in mind, and it should always be used in any of the larger forms of apparatus in which it is employed with the greatest care.

When it is used in a house, there are many who recommend that all pipes and fixtures should be tested from time to time, and should be required to stand a certain amount of air pressure. By those who are compelled to use coal gas, and who have any doubts as to the soundness of their gas pipes and fittings, the advisability of employing an expert to apply the test should certainly be considered, having regard to the undoubted dangers which are associated with an escape of gas.

If what has gone before has been properly appreciated and understood, it will be perfectly clear that on health grounds alone none of the three agents first considered are free from objection.

The one lighting agent, as already noted, which is free from objection on such grounds, is electricity. Clean, because it does not burn in the air, takes nothing from it, adds nothing to it either in the shape of dirt or undesirable gases: cool, because the rays produced are lighting rays, almost entirely, and not heating rays: convenient, because its light is produced without the necessity of applying a flame: comfortable, because it can be readily so shaded and adapted that it does not affect the eyes; it possesses all the qualities that the most ardent hygienist could demand of any lighting agent.

In the matter of cost, too, electricity in most districts is no more expensive than the other agents. With gas, especially, it compares most favourably. Unfortunately this is not generally understood, and stress is always laid upon the initial cost of introducing the necessary wires, and on the fact that the current may cost more than gas.

It is because it has been so frequently and unhesitatingly asserted that electric lighting costs more than lighting by means of gas that there has been so much delay in introducing this form of illuminant into the houses of the poor. By these even more than by the rich is a clean light required.

The dangers to health amongst the poor people arise to a great extent because they have not a proper supply of pure air, and because their surroundings are, or rapidly become, dirty.

This being so, to practically compel them to use as lighting agents substances which interfere with their meagre supply of air and increase the general dirtiness, is a most serious matter. No one needs a clean light more than the poor, and it is only the poor who are actually deprived of it.

If the claims made by those who are interested in the manufacture and sale of electricity—viz. that electric lighting is actually no more costly than gas lighting—are correct, then there should be no hesitation about providing them with it. Even if it is more expensive they should still have it.

The statement is often made that it is impossible to buy health. In the matter of lighting alone this statement requires modification. Health may be a thing that the individual cannot purchase, but things that make for health he certainly can.

Such things should be within the reach of all—the poor man as well as the rich. Of all the lighting agents which have been described there is only one, namely, electricity, which does make for health. The others possess inherent qualities which prevent them from doing so.

The things that do not make for health are much more dangerous to the poor man than to the rich man. To the poor man the things that make for health are even more essential. Everything about him tends to make them so. Why, then, should he not have them? If they can be bought, their price should be so low as to bring them within his reach.

If the price of an artificial lighting agent that makes for health, as electricity does, brings it as much within his reach as that of another agent, such as coal gas, which does not make for health, he should be told so.

For his health's sake he should be given every opportunity of using it.

Decoration and Furnishing of Dwelling-Rooms

The decoration and furnishing of dwelling-rooms possess an importance in relation to health which is not sufficiently or widely enough appreciated.

In relation to furnishing it has already been pointed out that space is chiefly what is required in the dwelling-room, and that in most cases space is much too valuable to be wasted upon furniture.

In the case of decoration the possibility of space being affected is comparatively small. It is in its bearing upon these two conditions—cleanliness and simplicity—which are the foundation upon which health rests, that its importance lies.

In choosing decorations those that are clean, those that make for cleanliness, and are easily kept clean should always be preferred. Those that are simple, free from any excess of ornamentation, from the health point of view are the best.

Simplicity of design, while it favours cleanliness, gives also an impression of cleanliness, and health to a remarkable extent is affected by impressions.

And it must not be understood that simplicity of design is to be limited merely to what is used for the covering of the walls and the ceilings.

The idea of simplicity should be carried out in the construction of the rooms as well.

Ornamentation.—In such places as hospitals, where it is essential that health should be, and everything that is likely to affect health must be, considered, the note struck is always that of absolute simplicity.

In the interior of the wards of a hospital, with the object of depriving dust and dirt of any hiding-place, ornamentation is avoided to the utmost extent. Surfaces are made smooth, ledges are sloped instead of flat, and corners are rounded instead of square. Panelling, even of doorways, is done away with as far as possible, and skirting boards are only exceptionally introduced. By these means cleanliness is practically ensured and cleansing is made easy.

And even with the ornamentations omitted, a hospital ward is not devoid of beauty. It is stiff, it is true, but the impression it produces is always a pleasant one, and pleasant impressions are not without their value.

Why should not the hospital idea be utilised in the construction of the dwelling-room?

Just as much, if not more, there has the question of health to be considered. Just as much there, is smoothness of surface, the absence of ledges, and the curving of corners an absolute essential.

What are the walls which offer the most convenient resting-places for dirt and organisms? The uneven and the rough walls, of course. What is the most difficult part of the work of the person sweeping out or dusting a room? Why, getting into the corners, of course. What are the things most neglected by the duster? The ledges and the corners, of course, and for no other reason than that it is difficult to get at or into them.

Examine any door in any house, no matter how well kept it is, and dust will almost of certainty be found in some or all of the corners formed by the panels.

Having regard to the fact that dust so often spells danger, because dust and germs always go together, and germs practically cannot move without dust, it is remarkable that corners have been allowed to exist so long in the home.

It is remarkable that women, usually well-informed and practical in matters of domestic detail, have never declared war against the corner.

Undoubtedly it is the ingrained conservatism of the human race that is at the bottom of it all. The man who first built a shelter found it easy to knock together a sort of box arrangement. Others imitated him, and so it became the established practice to make square corners in imitation of those to be found in boxes.

Using the materials now used in building, it cannot be any more difficult to round a corner than to square it.

And the advantages of a rounded corner are so tremendous; not the least being that the brush and the duster can easily get into and round them and take away anything that may be lying there.

That designers and builders will ever be brought to see these advantages is something more than doubtful. For some time, at any rate, the number of corners in the dwelling room is exceedingly unlikely to be reduced, and so long as this is the case the germ is likely to continue one of the common features of the home.

The Walls.—In the case of the walls and the ceiling it is unnecessary to conclude that nothing at all can be done.

The matter is entirely in the hands of the occupant, and if he desires the smoothness that makes for cleanliness or any of the other things that make for health in connection with decoration he can have them.

Smoothness is the first essential, because the smoother the surface the less dirty does it tend to become and the more easily is it cleaned.

Smooth materials to cover the walls are just as easily obtained as rough ones. Easily-cleaned materials are also easily found.

As a matter of fact, those who make wall-coverings make a speciality of providing washable paints or papers, and widely advertise the fact.

The chief point to be decided is as to whether a paint or a paper is to be used.

From the washable point of view there is nothing to equal a paint, and those who can afford to use paints should never hesitate to do so. The surface can be got absolutely smooth, practically any colour can be obtained, and cleansing and washing can be readily carried out without diminishing to any extent the life of the paint.

On the grounds that besides being expensive it is also cold, many people object to paint, and choose rather a paper.

In such a case also the smoothest is the best from the health point of view, and the only paper which should be chosen is that which has been so treated as to be washable.

In certain apartments, mainly those classed as offices, *e.g.* water-closets and bathrooms, and others like the kitchen, the surface of the paper may still further be made smooth and washable by covering it with varnish.

The main objection to paper is that it has a tendency to absorb moisture and even more dangerous substances from the atmosphere of the room. It is because paint does not absorb moisture, and on occasion may be visibly wet, that painted walls have come to be regarded as colder than those that are papered.

That it should be any advantage to have the moisture produced in a room, a moisture that is always contaminated with exhalations from the human body, absorbed, and so retained in the room, is difficult to understand.

Obviously it is better to be in the position to see what the things are that may do harm, and better still to be in a position to remove them. It is because paint allows of this that it is regarded as more hygienic than paper.

As an alternative to the more expensive paints and papers, what is known as "washable distemper" has been introduced. This is cheaper, not only because its ingredients are cheaper, but because it is more easily and rapidly applied.

In the better qualities and makes, this material possesses many advantages. It looks clean, and can be kept clean; it is non-absorbtive, and looks warmer than ordinary paint.

In the poorer homes it is certainly to be preferred to the cheaper classes of paper that are generally to be found in such places, and is often recommended for use in them.

Very frequently distemper is applied over existing papers, and though an appearance of freshness and cleanness is produced in this way, there is actually no cleansing carried out. The dirt on the under paper is merely covered over; the germs which have been collecting on the paper are merely provided with a material which they like, since distemper always contains size, and though some of them contain a little disinfectant, it is usually insufficient for any other purpose than to keep the paint itself sweet.

Unfortunately this covering up of old paper is done with other things than distemper. Workmen, because it saves them trouble, are only too ready to put fresh new papers on the top of old papers. There again the dirt is simply covered so that it cannot easily be got at, and the germs are given a supply of food in the shape of paste in which to live and multiply. This practice of papering over is one exceedingly commonly adopted, and it is no rare thing to find in houses of a certain class, as usual the class in which only the most sanitary practices should be adopted, layer upon layer of paper, each one dirtier than the other, decorating the walls.

In every case when a wall is to be repapered, or when distemper is to be used over paper, there should be insistence upon the necessity for stripping down to the plaster. Even when a room is to be redistempered the old distemper should, as far as possible, be removed, or at least thoroughly washed down.

As to the colour of the paint or papers, this is a matter of some importance, and the question, though to some extent chiefly an æsthetic one, is also a hygienic one.

The main point is, having the importance of impressions obtained through the senses in mind, to use something cheerful. A cheerful colour is, of course, not necessarily a bright colour; rather it is one that harmonises with the surroundings both inside and outside the rooms. Every room must, as a matter of fact, be treated on its merits, but in certain apartments the lighter the colours the better. In dark rooms this is practically the case because it is in such rooms that dirt is most likely to be found, and the lighter the colour scheme the more easily is the dirt found.

Colours that are restful to the eye should also be chosen, though here again it is to some extent the surroundings that decide as to the restfulness or otherwise of the colours.

Greens are generally safe colours, and are distinctly restful. They are particularly useful in sunny rooms. In rooms which are little exposed to the sun, pinks and reds give a suggestion of warmth. Reds are very commonly used in rooms in which food is taken, largely because they look comfortable and are, to some extent, stimulating.

Yellows also are good in more or less sunless rooms, and browns of various shades are greatly favoured by those who decorate their walls with pictures.

A matter to which at one time some attention was directed was that of the risk of poisoning by means of the arsenic used in preparing wall-papers. One or two cases of arsenic poisoning were proved to be due to sleeping in a room decorated with arsenic-coloured paper, and some considerable amount of excitement was caused as a result.

Nowadays few of the good paper-makers use arsenic at all, and if it is found it is only in the very inferior qualities.

Papers coloured green were supposed to be those in which arsenic was most likely to be found, but papers of other shades have been shown to contain it.

The symptoms produced by the absorption of small quantities of arsenic over any period of time vary considerably. Usually there is simply gradual failure of health, irritability of temper, and weakness: the skin becomes rather dark in colour, and there may be numbness in the limbs or even paralysis. In a patient suffering from arsenic poisoning the arsenic is usually readily detected in the urine if the proper tests are applied by an expert.

The Ceiling.—A decision with regard to the decoration of the ceiling is usually easily arrived at. Practically never is anything but white used in a dwelling room, and this is chosen because it assists in lighting and is clean and easily cleaned. For the purpose either paper, whitewash, or distemper may be used, and of the three the paper is the least satisfactory. It is unnecessary, after what has been said with regard to ornamentation, to point out that corners are not to be recommended, more especially as, situated out of reach of thorough cleansing, they are, as a fact, only very occasionally cleaned.

The Floors.—The floor of a room being exceptionally liable to contamination, and that of the grossest kind, from the feet of those who use the room, too much attention cannot be given to it.

In the first place, it must be absolutely smooth; there must be no open spaces between the floor boards, no cracks, and no crevices in which dust or dirt may lodge, and which cannot be cleaned out.

And the floor must be kept clean. In connection with this the question of floor coverings arises. It is becoming increasingly common, and it is certainly much more hygienic, to do away more or less with floor coverings altogether.

Nothing more opposed to health interests than the carpet which covers the whole of the floor boards, and which is nailed down all round, could possibly be imagined. Exposed to contamination by feet which may have picked up all kinds of foul and germ-containing material, it can never be properly cleaned as it lies on the floor, and the taking of it up for cleansing purposes is such an undertaking, furniture having to be moved and so on, that it is not done any oftener than can be helped.

As ordinarily carried out, the sweeping of a carpet does little more than loosen a part of the dust, drive some of it through to the floor, and set free the remainder in the air of the room, to be inhaled by the occupants or settle down on the carpet again or on the furniture.

A similar disturbance of the dust occurs every time anyone walks upon the carpet, and it is practically certain that no inconsiderable portion of the dirt transferred from outside to the inside of a house finds a resting-place inside the persons who live in the house.

As this dirt may contain disease germs such as that of consumption, the careless habits of some of those affected with this condition permitting them to discharge germ-containing expectoration on the street or pavement, the risks of infection must not be overlooked.

To get rid of this risk, the only thing to be done is to avoid the carpet as a floor covering. Bare boards are better, but the objection to them is that if they are kept clean by scrubbing with soap and water, the wood gets into a bad condition as a result of being soaked and dried, and the spaces between the boards get opened up. To overcome this difficulty, the boards may be either waxed and polished or covered with linoleum.

Both of these methods are good, and may be recommended.

It must be borne in mind, however, that it is really only a very good floor that can be properly treated by the first method, and that the latter is somewhat expensive, and the linoleum must be made to fit absolutely close.

One objection sometimes raised to the polished and uncovered floor is that it is slippery and rather cold.

Where they are used, however, loose rugs which can be easily lifted and taken outside for shaking and beating are usually employed, and certainly add to comfort without interfering to any extent with cleansing and cleanliness.

As is so commonly seen with unhygienic arrangements, it is usually amongst the less well-to-do that the carpet is most in favour.

The carpet used in these cases is often of an inferior quality or is secondhand.

Because the inferior quality carpet does not last it is expensive. The second-hand carpet is objectionable also on this account, but even more so because, before it is laid, it is already dirty and contaminated with no one knows what germs.

Amongst the well-to-do the hygienic method of dealing with the floor is most commonly found. Few of their rooms are fully carpeted, and if they are the carpets are frequently taken up for beating and cleansing.

With the poor person, once the carpet is down the inconvenience and expense of getting it up are so great that it is allowed to stay down, and to go on collecting dust and dirt.

Apart from obtaining objectionable contamination from outside, it is open in such a home to contamination in other ways. The rooms are generally few, and all are used by all the members of the family. Children, often of tender years, are allowed to crawl about upon the floor, and may assist in contaminating it. They may also pick up objectionable matter, and matter which has been contaminated by contact with it. Infection may quite readily be obtained in this way, or by swallowing or inhaling the dirt from the floor, and in one disease at least, viz. "spotted fever," the fact that floors upon which they have been allowed to crawl may have been the source is insisted upon by many.

The carelessness which permits a consumptive person to spit upon the pavement permits him also sometimes to do the same thing on a floor.

Examples of this are only too frequently found by those who work amongst the consumptive poor.

The objections to the practice need not be insisted upon, and the dangers must be obvious to everybody. The possibility of getting rid of all the germs by rubbing and cleansing is infinitely less with a carpet than where the boards are bare or covered only with linoleum.

Furnishing.—It has been pointed out so frequently in these pages that space is so valuable in the dwelling-room that it scarcely seems necessary to say much with regard to furnishing. This is more especially the case as the important matter of furnishing of bedrooms is considered in another section, and some reference is made there to the general principles underlying the whole question.

The great point about furniture is to provide only what necessity and convenience require.

Every additional article means loss of space and something more to be kept clean.

The articles chosen should not be too bulky and heavy. The more easily the contents of a room can be moved about the more easily can the whole room be cleansed and the more likely is it to be cleansed. In the case of the articles themselves the same remark applies. It is the small chair that can be twisted round about and turned upside down that gets all the cleaning; the large arm-chair, the couch, the table, and the piano rarely get anything more than a surface cleansing, and that even is limited to the surfaces that are seen.

If cleanliness is to be considered (and from the present point of view it is the only thing to be considered), the lighter and smaller and simpler the furniture the better. The chair that is plain, free from ornamentation and, above all, free from stuffing; clean to begin with, and likely to remain clean, can be kept clean with infinitely less trouble than the chair that is stuffed and carved.

In the first place the material used for stuffing the cheaper variety of chair is not always certain to be free from contamination, and in the second it absorbs and retains contamination that cannot quite be got rid of by beating. This necessity for beating stuffed chairs as well as other stuffed articles of furniture—couches, cushions, footstools, &c.—is one that should be particularly noted.

The dust which they acquire is partly rubbed in, partly produced from the stuffing itself as a result of use. In use this is apt to be expelled, and to take with it or to pick up dirt and germs.

Reduction in the quantity of this material that may be set free in the room is very desirable, and is only to be obtained by thorough beating in the open air if possible.

In cleansing the larger essential articles—tables and such like—the quality of lightness is likely to be appreciated only by those who believe in thorough cleanliness, and who want to get rid of the concealed as well as the obvious dirt. The table that can be tilted over for cleansing underneath is much more likely to be found free from dust underneath than that which is so heavy that the cleaner has to crawl beneath it in order to reach the under surface. The corner that is occupied by a light piece of furniture is much more likely to be cleaned out frequently than that into which there is pushed a piece which can only be moved with difficulty.

That old dust may be much more dangerous than that recently deposited seems exceedingly likely, if for no other reason than that it contains more germs. There is this in support of that view, at any rate, that in most households colds, influenza colds, and influenza are always much more common at spring and autumn cleaning times than at any others. Those who love their books, and from time to time, at more or less long intervals, take down those on the upper shelves for dusting, not infrequently find that they catch cold then.

This is no doubt due to the fact that they disturb and inhale dust which has been increasing in amount, and at the same time collecting a sufficiently large number of germs to give rise to infection.

This is a point which will come in better in relation to cleansing of dwelling-rooms, but it may just be mentioned here that it is because the germs are likely to be blown away, and the amount of infection reduced by the air, that dusting with windows open and beating of rugs, chairs, &c., outside is recommended.

In connection with books, reference may be made to what is not uncommonly apt to prove the heaviest piece of furniture in any room, viz. the bookcase. How the books may become a danger has already been noted. To avoid the danger it is necessary to dust the books frequently, and to avoid blowing or beating the dust off except in the open air. To get behind the bookcase it must, of course, be pulled out, but the necessity for this can be overcome by using movable shelves or a case of the sectional type. In order to protect the books themselves from dust some book lovers place a layer of felt along the top.

In order to protect chairs and so on from dirt, the use of removable and washable covers is to be recommended. Similarly, cushions should also be provided with loose washable covers. These should all be frequently taken off and washed, and whatever there is underneath cleaned by beating or in any other way that seems applicable.

Ornaments.—In any room a multiplicity of ornaments is to be avoided. In poor houses more than anywhere else is it usual to find this piece of advice neglected.

Overlooking the fact that every additional vase placed upon a shelf or dresser, and every additional picture hung upon the wall, means one more dust collector, one more article to be kept clean, the poorer class housewife goes on adding to the number.

But it is not only the poorer class person who collects unnecessary things such as these.

Women who love and appreciate cleanliness and a clean home load up every flat raised surface with vases and figures, and pile what is left over into a glass-fronted case which, because of the risks of breakages, is rarely moved.

The extent to which ornaments are capable of collecting dust is tremendous. Since each must be lifted up to be dusted and to allow of the surfaces underneath to be dusted, they must add greatly to the amount of labour involved in this process.

Pictures as dust-collectors deserve a special word to themselves. That they act as the hiding-places of vermin of various kinds, and that instances of rooms becoming infested with bugs from pictures brought into them are not unknown, may also be noted. Fortunately pictures are easily cleaned, and if there is any suspicion regarding an old-framed picture the back should be examined and the paper or other covering removed and renewed.

Cleansing and Cleanliness

The importance of the relation of cleanliness to health has so frequently already been referred to that there is little or no call to impress the necessity further.

The association of dirt with disease has also been referred to, and it is interesting to note in this connection that there are quite a number of diseases which are called dirt diseases.

Typhoid fever, spotted fever, and some others are placed in this group, but as a matter of fact, any disease which is a germ disease is also a dirt disease.

Consumption, for example, may be and often probably is, spread as a result of dirtiness. More than once the germ of this disease has been found in the dust of rooms occupied by consumptive people, and it is quite easy to explain how it got there.

What happened probably was this, that a consumptive in coughing sent out a fine spray of fluid from the windpipe and lungs, and along with it a number of consumption germs. The fluid settled on the walls or elsewhere in the room, and then as a result of the heat the moisture evaporated. What was left, and in it were the germs, soon got rubbed off and mixed up with the other dust, which thus became a possible source of danger.

In the same way other diseases may be caused. The example of influenza and colds has already been given, but diphtheria, pneumonia, diseases the cause of which is known, and scarlet fever and measles, of which the cause is as yet unknown, may be spread in the same way.

The fact that children may pick up the germ of spotted fever or infantile paralysis with dirt from a neglected floor is also worth repeating.

If for no other reason than that there is a possibility of one or other of the infectious diseases being acquired, it is worth while attending carefully and systematically to cleansing of the living rooms.

How to clean should be part of every girl's elementary education.

She should be taught first of all the value and importance of cleanliness. A horror of dust and dirt should be instilled into her. She should be told that cleansing is not a thing to be carried out by fits and starts, but to be done regularly and methodically day after day. There are so many matters in connection with housewifery that girls and women are supposed to have a heaven-sent acquaintance with, and cleaning is one of them.

This theory, though a very comfortable one, has undoubtedly been the cause of many disasters, and the sooner it is grasped that dusting, and sweeping, and turning out of rooms are as much arts that have to be learned, as are cooking, and the laying of a table, the better.

How many girls know, for example, how to set about cleansing a room ? How many know that in sweeping and afterwards dusting a room the window should be kept open at the bottom, that a slightly damp duster is best for dusting, and that, unless one or other of the patent sweepers or cleaners be used, the sprinkling of something damp like tea-leaves upon the floor is a wise preliminary to sweeping ?

How many know that the windows are open to let out any dust raised, and the damping done to ensure that all the dust possible may be collected and as little as possible set free in the air ?

Experience would seem to show that only too few know these things. How, then, can it be hoped that many will know or recognise the advisability of having easily-cleaned furniture in a room, or be in a position to appreciate the hygienic advantages over the nailed-down carpet of the rug that can be lifted up and beaten ?

Instruction on these matters is absolutely necessary, and must be given.

Take the girl into a living room; show her how dust collects—in the corners, on ledges, on the mantelpiece, on the tops of pictures, on the ceiling especially near the fire and over the lights, on the furniture, the walls, and so on ; tell her how much the floors are exposed to contamination ; explain to her how important it is that all the daylight possible should gain access through the windows ; let her see how the air from outside with its smoke and dust helps to make things dirty, and so on.

Then teach her how to begin to get rid of the dust ; to open the window ; to manipulate the furniture so as to allow of easy access to all corners ; to cover up all articles that cannot be taken outside for dusting, shaking, or beating ; to do the fireplace, to finish sweeping floor and walls, before beginning dusting ; to appreciate that "sweeping out" is talked about because the object is to get dirt and dust *out* of the room ; to get at all parts of every piece of furniture for cleaning ; to use a slightly damp duster, and to polish afterwards with something dry.

In a word, the girl must be taught method and thoroughness. The unmethodical and slipshod cleaner is a distinct menace to health. She helps in the spread of disease by leaving germs to grow undisturbed, or by scattering them about in her attempts to remove them.

It is fairly safe to say that if proper instruction in cleaning were given there would almost certainly result a reduction in the amount of disease, because there would be brought into existence a body of women who, knowing the dangers of dust and dirt, would have but one object, viz. to get rid of it.

The short description given above, though it refers to a fairly thorough cleansing, will not serve of itself to keep a living room clean. Dirt will form and collect in spite of it. As a result of contact with the bodies and clothing of the occupants of the room, the walls and furniture acquire a certain amount of dirt that requires something more than mere sweeping and dusting to remove it.

A thorough cleansing must, therefore, be undertaken from time to time. The room must be turned out ; walls must be rubbed down or washed down, or even re-decorated ; furniture that is washable must be washed ; the covers of articles of furniture that are removable and washable must be removed and washed, and so on.

In the thorough cleansing nothing must be overlooked. The windows, of course, need not wait for the complete turning out ; they must be done regularly at longer or shorter intervals, depending upon the neighbourhood and the condition of the atmosphere. The same remark applies to the curtains.

If the chimney plays the important part in connection with ventilation that it is alleged and generally believed to, then it is of the utmost importance to ensure that it shall be kept freely open. Therefore do not overlook the chimney, but have it swept and cleaned too.

But it is not only because it is a ventilator that the chimney must be kept free from obstructions. A dirty chimney is objectionable because, when not fully open, it hinders the passage of the smoke from the coal or whatever is burned in the fireplace, and dirt and gases of various kinds pass back into the room and contaminate the air to be breathed.

A "smoky" chimney is perhaps one of the most objectionable ills that a house can suffer. It is true that smokiness is most often due to a bad draught, to the chimney being improperly constructed or hemmed in, but sometimes it results from collections of dirt inside the flue, and can be overcome by sweeping.

The fact that there is danger of the soot deposited in the chimney catching alight must not be overlooked. Apart from the danger of the fire spreading there are other objections to permitting a chimney fire; dirt passes back into the room; the wall-papers over the chimney are very liable to get stained; foul-smelling and dangerous gases escape through the brick-work into the house; and it sometimes occurs that mice and other vermin living near the chimney are killed, and their bodies, putrefying under the floor, give rise to nuisance or more serious trouble by giving off bad smells.

If gas fires are used, cleansing in all probability will not have to be carried out so frequently, but, inasmuch as soot is produced, and it is important to have a free up-draught to get rid of the products of combustion, the flue should not be neglected, but be cleansed from time to time.

With electric radiators, of course, no soot is produced, but even with these the chimney should be looked at now and then.

In rooms in which food is prepared or eaten cleanliness is, of course, all important, and it must be remembered that vermin—mice, beetles, and rats—which are dirty creatures and open to grave suspicion as disease-carriers—are to be expected if crumbs and scraps of food are left about.

The house in which mice are most plentiful is that in which there is carelessness and extravagance in connection with food. As far as possible the floor of the kitchen and dining-room should be left free from crumbs, &c., at night, and corners in which they may lodge must be freely and regularly cleansed. The Jewish religion, one of the chief tenets of which is cleanliness, requires that, just before Passover, the house must be thoroughly examined for forgotten crumbs of leavened bread.

In this the Christian might do much worse than imitate the Jew, but the search should be carried out more frequently than once a year.

If it did not reveal the existence of any crumbs it would, in all probability, bring to light some forgotten collections of dust and lead to their removal, and so to the removal of something which may at any moment be a menace to health.

The Convenient House and the Various Apartments

All that has gone before applies generally to all rooms, and the various conditions with which there must be compliance in any living room if health is to be safeguarded and disease prevented have, as far as possible, been touched upon.

In this section it is proposed to say a word particularly with regard to each of the rooms usually found in a dwelling, and to refer to any features which may be considered peculiar to any one of them.

Arrangement of Rooms.—A very important matter, and one which is only too frequently neglected by designers of houses, and generally not detected by tenants until they have taken possession of the dwelling, is convenience of arrangement.

There is commonly a good deal of talk about convenient and inconvenient houses, but usually it is little more than talk, and there seems to be a curious tendency to take an inconvenient house just as readily as a convenient one, and to do nothing more than grumble about it afterwards.

In choosing a house one of the most important matters to make quite certain about is as to its convenience for cleaning. A house should not be chosen because the sitting-room looks pleasant, or there is nice paper on the walls or artistically designed door-knobs. The important point to be decided is: Can it be easily kept clean? Is there light enough everywhere to show up dirt? Can the dirt be easily got at if there is any? Is there water handy for cleaning all and any of the rooms?

The ideal home is that in which cleansing can be easily carried out. It is one in which there are no dark passages, halls, and corners. It is one which is simply arranged, all the rooms being easily accessible and all easily turned out.

It is almost of necessity a roomy house. The house which is most difficult to keep clean is, of course, the small house, but even this, if cleansing and cleanliness have been thought of in connection with the arrangements, need not be seriously unworkable.

The Kitchen.—The kitchen is so continuously used, is often indeed a living room, and in it processes which call for absolute cleanliness and yet at the same time tend to give rise to untidiness and even dirtiness, are so regularly carried out, that it becomes absolutely essential to see that it is clean and capable of being easily cleaned.

Moreover, it is apt to be a very warm room, and it must, therefore, be a room easily ventilated, and (though this is open to objection because it is so much a living room) it should not be too much exposed to the sun.

Preferably it should be so situated as to allow of easy access to the dining-room, and, as is the case in most modern houses, it should be on the same level as this room.

The old-fashioned plan of placing the kitchen in the basement is now gradually disappearing.

In such a situation it is almost impossible to get a sufficient amount of daylight, and also there is apt to be dampness. Moreover the basement kitchen means more work for the domestic staff, and quite often diminished supervision by the mistress of the house. It is alleged by some that servants prefer basement apartments because it gives them greater freedom. It is exceedingly doubtful if any servant does like a basement kitchen, and it is quite certain that many refuse to work in a house where there is one. Where the apartment is one having its floor far below ground level and is dark and dingy, they are right in doing so. No one should be asked to work in a place where artificial light is required during the hours of daylight, and the window or windows open entirely, or to any extent, on to a space so narrow as the majority of the areas provided outside basement rooms.

Cooking Appliances.—In every kitchen the most important appliance, and that which is responsible for many of the unsatisfactory conditions, dirt, excessive heat, &c., is the cooker.

To a considerable extent, of course, the conditions are affected by the type of cooker provided, and whether or not it is properly used.

In the majority of kitchens, even in houses of the best class, the type in which the fuel consumed is coal is that preferred. Many cooks claim that with the range burning coal they get far better results, and that it is more convenient, inasmuch as with it there is no difficulty about hot-water supply.

How it is possible to get good results from an apparatus in which the heat is apt to vary from time to time unless careful watch is kept, and which can only be kept going by the expenditure of a considerable amount of energy in throwing on fuel, it is difficult to understand.

A cooking stove in which the required temperature can always be obtained and maintained by the mere adjustment of a tap, as in the electric or gas apparatus, would almost seem to be of necessity the ideal. With these there is no necessity for nursing the heat. So long as the cook has some sort of idea of the amount she requires for any process and for each stage in each process, the remainder is easy. All that is required is regulation, and this is a mere matter of turning a tap or touching a switch.

The question of convenience in relation to hot-water supply is, of course, an important one. Doubtless many people have determined to continue to use a coal range because they feel that if a cooker of another class is introduced the range will still have to be used to heat the water in the boiler.

This difficulty has been overcome in some instances by introducing a slow-combustion coke stove for no other purpose than heating water, or what is commonly called a "Geyser," in which the heating is done by gas, and which can be turned on and off as required.

The former is particularly recommended for use in connection with an electric cooker, and is preferred by many because, if placed in the kitchen, it helps to heat the apartment, and there are fewer risks with it than with a geyser.

Further, with the stove it is possible to burn a certain amount of refuse during the night, and so reduce the amount of this which has to be thrown out, and which may give rise to nuisance.

The fact that with an electric or gas cooker all opportunity of burning refuse is lost, is one which is regarded with some seriousness by many. If, however, the refuse container is stored in a suitable place, and is emptied regularly and frequently, especially in the warmer weather, no really serious nuisance need result.

One advantage which is obtained by using something other than the coal stove is cleanliness. The fact that the combustion of coal is associated with dirt production has already been sufficiently referred to. In the kitchen range large quantities of coal are usually consumed, and a correspondingly large quantity of dirt is produced.

With the other cookers solid matter is not burned, and dirt of the same kind is therefore not formed.

From the cleanliness point of view the stove in which electricity is the source of the heat is, of course, the better. With burning gas there is always dirt production to a certain extent, and there are other objections as well which have already been referred to, viz. contamination of air during burning, risks of improper lighting, and so on.

These, to some extent, can be met by placing the gas apparatus under a hood which is provided with a flue leading into the chimney or directly into the open air. Unfortunately, proper precautions are only too rarely taken in connection with gas cookers. Even well-qualified workmen employed by responsible companies will place a gas stove far away from a chimney, or even on a landing, or in a room which contains no fireplace, and when the apparatus is in use the products of gas combustion are poured straight into the apartment, greatly to the detriment of the air to be breathed by the occupants.

Too often such defective arrangements are found in the homes of the poor, where accommodation is limited, and any interference with air a thing to be strenuously avoided.

It cannot be too strongly impressed that gas, if it is to be used at all, must be used carefully; that all gas apparatus must be properly placed and properly used, and provision made for carrying off the products of combustion.

In connection with gas cookers, a point to which attention may be directed affects that portion of the apparatus in which roasting is carried out.

In most of the stoves in use the food to be roasted is exposed to the action of the naked flame; is shut up with it, and any products that may be derived from the burning gas, in the oven. In the more modern gas cookers this objection has been met by placing the gas jets in sealed chambers within the oven. This may mean that more gas is consumed in cooking than with the old arrangement, but it is worth something to have food cooked in air that is free from the products of combustion.

Since the practice of cooking by electricity is becoming increasingly common, a further word may be said with regard to it. The reason the electric cooker is preferred by many to one in which the heat is derived from coal or gas, is because it is cleaner. Also, as there is no combustion, the apparatus can be placed in any convenient position, and there are no products of combustion set free to contaminate the air of the apartment.

From the health point of view there is every reason to prefer the electric to any other form of cooker. The reasons given in the case of the electric heater apply equally in the case of the electric cooker.

From the practical working point of view all experience goes to show that there is nothing to choose between the cooker heated by gas and that heated by electricity. The one is as easy to manipulate as the other.

The only objection that can be raised to cooking by electricity is in the matter of cost, and that is a question unnecessary to discuss here. It may be pointed out, however, as was pointed out in relation to electric lighting and heating, that definite proof is wanting that electricity is more expensive to use, even if no money value is placed upon other advantages claimed for electricity, viz. that it is cleaner, that it does not interfere with air and therefore health, that it reduces the bulk of the food less than any other method, and so on.

Decoration of the Kitchen.—Something has already been said with regard to the decoration of the kitchen, and it was advised that a washable or even a varnished wall-paper should be used. This advice may be repeated, and the further advice given that the walls should be rubbed and washed down frequently.

As to the covering of the floor of the kitchen. Carpets, of course, are to be avoided. Preferably a covering of linoleum should be used, but in the case of basement kitchens, where there is always a risk of dampness, especially if there is a stone floor, this material is rather apt to rot.

The best floor for a basement kitchen is one consisting of wood blocks set in concrete, and then either the floor may be left uncovered and polished or covered with linoleum.

The kitchen and all that is in it must be kept clean. The table and all instruments and appliances used in cooking should, of course, be kept scrupulously clean. Many cover the table with the so-called "American Cloth," which being shiny is easily kept clean, and does not take up and retain fluid in the same way as the bare wood.

The suggestion offered previously to discourage vermin by avoiding leaving scraps of food about may be repeated.

Apartments used in conjunction with the kitchen, viz. the scullery, and so on, are dealt with elsewhere.

Other Rooms.—The bedrooms in a house are so important that a separate chapter is given over entirely to their consideration.

That leaves only such rooms as are used as dining-rooms, and those that may be classed as sitting-rooms, to be dealt with, and little further need be said with regard to them.

In their construction, decoration, furnishing, and use there must be applied those principles that have been described in the preceding pages. The best possible use must be made of such space as is provided, and sight must not be lost of the fact that it is the human occupant who is chiefly to be considered.

For that occupant a plentiful supply of clean, pure air is required, and this is to be obtained by using fully and properly the openings provided in the rooms to get air in pure and to get it out when it is impure.

The room and its contents must be kept clean, so that dirt may not be added to the air: heating and lighting agents must be used that will only little or not at all vitiate or contaminate the air.

The decorations of the room must be such that they are easily kept clean. At the same time they must be cheerful, so that the advantages of cheerfulness to health shall be obtained. The furniture, besides being not excessive in amount, should be light and easily cleaned.

And generally the advantages of cleanliness and simplicity must be appreciated. Upon these two conditions health almost entirely depends. There is practically not a disease germ capable of obtaining a hold or of retaining a hold where these two conditions exist.

If they are sought for in everything connected with the home and in every part of the home, almost certainly the health of every occupant of the home will benefit.

The Sleeping Apartment

It is remarkable how few people realise how considerable a proportion of his life an individual passes in his sleeping room either in or out of bed.

Fewer still realise that during sleep life is at its lowest ebb, and that resistance to disease is greatly reduced. At the same time, however, sleep is very certainly nature's sweet restorer, quiet, sound, undisturbed slumber being one of those things which brace the body up to resist all influences which tend to undermine health or render the individual liable to disease.

If the fullest possible benefit is to be obtained from the hours passed in it, the sleeping room must be chosen with the greatest of care, and made the brightest, cleanest, and most hygienic of all the rooms of the house.

Wherever possible, it should be used for no other purpose than sleeping, and the fewer the people who occupy one sleeping room at a time the better.

The chief cause of the impossibility of having sleeping rooms distinct from living or workrooms, and of giving each person a sleeping room to himself, is, of course, want of space, and space is wanting because housing accommodation costs so much.

To all intents and purposes it is only the rich who can pay for the space necessary to live a real healthy life, and space is perhaps the most valuable thing upon which they expend their money.

Amongst those who have not the money to obtain proper housing accommodation the last thing thought of seems to be the sleeping place. To them it matters little where they sleep: so long as there is some sort of bed under them and some sort of roof over them, they are apparently satisfied.

In regarding the sleeping place as of secondary importance quite a number of people who could do better for themselves more or less imitate those less fortunately situated.

Such persons, for example, will waste a valuable room in order that they may have an apartment which they term variously the "parlour" or the "sitting-room" or the "drawing-room," but which they practically never put to the uses to which such a room should be put.

In order to do this they crowd into other rooms a number of individuals, in some instances far in excess of that which they are capable of accommodating if regard is to be had to decency and health.

Practically a room which is used for sleeping purposes and for other purposes as well can never be regarded as satisfactory.

It is too difficult to obtain in such a case compliance with the requirements of a healthy sleeping room. The necessities attending the other uses bulk largest and are considered first.

Important Requirements.—The sleeping room, for example, should be spacious: it should be provided with the minimum amount of furniture, drapings, and so on, consistent with comfort: it should be so arranged that it can be easily cleansed: it should be kept clean: it should be well lighted:

it should be airy: the occupant should find clean, pure, uncontaminated air in his bedroom when he retires to rest, and all the time he is at rest he should breathe pure air.

How can these things be obtained in a room which is used for living; which is used, moreover, from morning to night and from night to morning? They cannot be.

The Ideal Bedroom.—This is the ideal bedroom. A room well above the ground level, spacious and well shaped, with a good window looking in such a direction that the sun—when there is any—can enter some time in the day; south or east or west or a combination of these. A northern aspect is not so good, as it is apt to be cold, and the benefit of the sun's rays in purifying and brightening the air is not obtained. Decorate such a room with something light in colour and, for obvious reasons, washable, because lightness and brightness increase cheerfulness and therefore improve health. Where cheapness is a consideration, distemper is to be preferred to the low-priced wall-papers, which, in addition to being over-patterned and therefore harassing, sometimes, though rarely nowadays, are coloured with materials containing poisonous substances such as arsenic. Moreover, they are difficult to clean and are not usually washable.

Since vermin such as bugs, and to some extent lice, prefer woodwork, and their association with disease is something more than possible, let the bed, or if there be more than one occupant, the separate beds, be as far as possible of metal with a spring mattress and without draperies. Place it so that only the head is against a wall. Cover it with clean, light coverings. Wherever possible use a hair mattress, and avoid those made of flock, because they are apt to be dusty and dirty, and soon become lumpy and uncomfortable. Avoid also a feather mattress, which retains far too much heat and is also dusty. Since carpets collect dust and are difficult to keep clean, cover the floor with linoleum and rugs (not skins) or Indian matting. Have few pieces of furniture, and these preferably of light wood easily washed. The top of the wardrobe should be sloped, or if flat should be cleaned regularly and often. The window drapings should be simple and washable: the casement curtain is perhaps the best. The pictures should be few and the ornaments fewer.

The whole object of these arrangements is the simplification of cleansing, and the removal, as far as possible, of the chance of dirtiness, for, while there should be no dirty rooms in a house, the bedroom should be cleanest of all.

The great objection to dirt, of course, is that it contaminates the air not only with visible impurities, what is called dust, but with those that are invisible—living, such as germs which are carried about on the dust; without life, such as offensive smells and organic matter from the occupants or the contents of the apartment.

Nowhere in a house is it more important to have uncontaminated air than in the sleeping room, and a great deal towards prevention of contamination can be done by attending to the suggestions offered above as to furnishing and arrangement.

Ventilation of the Sleeping Room.—The best way to keep the air pure is, of course, to attend carefully to the ventilation of the room, but if it is a sleeping room and nothing else, and the considerations referred to above are attended to, this should present little difficulty. Formerly the view with regard to ventilation was that what was required was to keep the air in a room, as regards its chemical composition, like the air outside, *i.e.* with as little carbonic acid and as much oxygen as possible in it. For this purpose, inlets through which the air from outside might come in and outlets through which the air in the room might pass out were provided, the passing in and out of the air depending upon the natural tendency of cool air to flow into a warm place and of warm air to flow out into a cool place.

The more modern tendency is to regard the chemical composition of air as of little importance, the heat of the air and the movements in the air as all-important.

The acceptance of this does not materially affect the problem of ventilation, since in any case openings and movement are necessary.

The openings in the sleeping room are the same as in any other room—the window, the door, and the chimney. The first two act usually, though not exclusively, as inlets, the last as an outlet. Naturally they act best when they are open.

The Open Window.—The window is by far the most important of the three, and as is now generally recognised, it should be kept open top and bottom day and night.

The only excuse which should be accepted for closing the window of a sleeping room is that it is necessary to keep out noise or smell or fog, or that, as is sometimes unfortunately the case, the bedclothes are insufficient to keep the person properly warm. In cities the noise objection to the open window is perhaps the greatest. The possibility of noise affecting health by disturbing sleep is undoubted, and if it is impossible to escape it in any other way, the window should be shut and greater dependence placed upon the door and the chimney for ventilation.

A certain amount of fresh air always enters through the window even when it is closed: through the door also cooler and probably fresher air comes. The chimney, of course, acts as the outlet, and it is because of its importance in this connection that the rule has been laid down that in every room, no matter whether a fire is ever lighted in it or not, a fireplace with a flue should be introduced.

Quite commonly, possibly more frequently in bedrooms than in other rooms, the fireplace is covered in or the chimney closed up. This undoubtedly interferes with ventilation, and should never be done. There are many who say that a bedroom door should never be shut. Certainly during the day it should, like the windows, be kept open, but at night there comes in the desire for privacy, the objection on the score of immodesty, and the hereditary unreal need for protection from attack.

In the room in which there are plenty of cubic feet of air space, more than the 1000 feet which has been calculated to be the minimum for an adult, the risk of closing the window and door is not so great. In that in which the irreducible minimum of 300 cubic feet, which is that set down for the homes of the poor, is more nearly approached, the openings, especially the window, cannot with safety be closed at night. Stagnation of air in such rooms is inevitable, and apparatus for heating —the fire and so on—which are supposed to lead to currents, so affect the quality or composition of the air that they probably do not improve matters.

Heating of Sleeping Rooms.—The relation of heating to ventilation to the extent that it does give rise to movements in the air is undoubtedly important. In a room the size of an ordinary sleeping room, which is provided with the ordinary openings, the door, the window, and the chimney, its importance is probably not great. In choosing the form of heating to employ, the question of the effect produced on ventilation need not, as a matter of fact, be given very much attention.

By the majority of people in this country, indeed, it is not considered, since heating is usually only carried out exceptionally, *e.g.* in the coldest weather or when the room is used as a sick room.

Comfort and convenience, and the effect produced upon the air itself, are practically the only points to be considered in connection with the choice of the form of heating, but as this matter is further and more fully dealt with in relation to health in living rooms, it is unnecessary to say more here.

Lighting of the Sleeping Room.—The subject of lighting is also discussed in the chapters relating to the living room. In the bedroom more than anywhere else is it important to have plenty of window space, and to admit large quantities of sunlight and daylight. The artificial light must be a clear light, and there is nothing which fulfils this requirement so well as electric light. The candle and the lamp, except in the country or very old houses in towns, have practically disappeared.

They were notoriously dirty, adding always undesirable emanations to the air. They further interfered with the air by heating it and consuming large quantities of oxygen.

Not far behind them was and is gas. It too, even when incandescent burners are used, interferes with the air, since, depending for its combustion upon the air, it naturally robs it of some of its constituents. In the course of this combustion it adds other and objectionable constituents too, merely because it is burned.

This burning is usually commenced long before the individual retires to the room for the night, and all this time the air is being interfered with, contaminated, and vitiated. Even with the incandescent burner with the bye-pass there is always a risk of the flame being extinguished by a draught or otherwise, and of the raw gas escaping.

The risk of this is very real, and the objections to the leaving of a peep of gas in a bedroom very considerable.

So far as is known at present there is no light so clean as the electric light. It lights a room but does not burn in the atmosphere, uses none of the air up, does not heat it, neither adds to nor takes anything away from it. Electricity is, and has been called, elemental purity, and as such is the ideal light for a room like a sleeping room, where the most important thing to be provided is clean, pure air.

The Children's Sleeping Room.—In no house are there any more important rooms than those provided for the children, and their sleeping room is the most important of all.

The details already given should be scrupulously applied in the night nursery. Simplicity is the note to be struck, lightness and brightness the aim. Simplify the furnishing and the decoration as far as possible : see that everything introduced is clean, is easily cleaned, and is kept clean.

The heating and the lighting agents should be the cleanest obtainable, and what has been said about these should be borne in mind.

Never overcrowd the sleeping room with individuals any more than with furniture.

Adults should not sleep in the children's sleeping room if the necessity can be avoided. As soon as children are able to go through the night without attention they should be given the room to themselves. They should certainly never, even in infancy, share a bed with an adult, but should be allowed to get the air they breathe, uncontaminated by the exhalations of any grown person.

Slops unavoidably made in a bedroom should be removed as soon as made, and each child should be taught and compelled to use the bathroom, the lavatory, and the water-closet as early as possible.

Unsuitable Sleeping Rooms.—It has already been pointed out that a room used during the day as a living or workroom cannot suitably or desirably be used as a sleeping room. To use a kitchen as a sleeping room, as is sometimes of necessity done, is particularly objectionable. To prepare food in a room which is used as a sleeping room is almost worse than to sleep in a room in which food is prepared.

The person who sleeps in a room that is lived or worked in by day practically never gets clean, fresh air either by day or night.

Apart from the fact that the beneficial effect produced by change of environment is lost, the room is bound to contain an excess of furniture and apparatus to meet the two purposes which it serves. Cleaning is difficult, and is never really satisfactorily carried out. The air is therefore contaminated by dirt as well as by other matters, from the occupants, for example, and it is apt to be overheated.

A particularly objectionable form of sleeping apartment is the "bed-closet," formerly so common, and still found in many houses in Scotland. These places, sometimes quite dark, are always insufficiently lighted. To all intents and purposes they are not ventilated, the air which they contain never being really properly changed from year's end to year's end.

The bed-closet also, being small, is difficult to clean, and as a fact, rarely is thoroughly cleaned. As it forms a convenient receptacle for soiled linen, lumber, and dirty articles, and is commonly so used, the objection to it is increased.

In association with the bed-closet the fixed-in bed is often found. Even in country places this is disappearing, which is fortunate, since a more insanitary and unhygienic fitting it is almost impossible to imagine.

It has already been indicated that the sleeping room should be as high up as possible. Unfortunately, such a position is not or cannot always be obtained, and in many large towns quite a number of people sleep in rooms underground. Servants are sometimes put to sleep in such positions, and occasionally—much less often now than formerly—are given an apartment without proper means of obtaining light and air from outside.

The difficulty with the underground room always is to get sufficient daylight and air. With regard to light, it is sometimes pointed out that as the room is used at night daylight is unnecessary.

Those who make this point, of course, overlook the fact that daylight prevents the growth and development of germs, and indirectly leads to cleanliness by showing where the dirt is at the time when cleansing is usually done, viz. in the daytime. That a room which is continually lighted artificially, more especially by means of gas, loses all its freshness and sparkle, and some of least of its oxygen, is also forgotten.

Underground rooms, it may be added, are apt to be damp. The risks of sleeping in a damp room are referred to elsewhere, however, and need not be again enlarged upon.

Amongst unsuitable rooms there should be placed also the badly-shaped, though these, especially in poorer-class tenements, are so common as to be almost the rule. A badly-shaped room is one in which the bed cannot be placed so that the head only is against the wall, or so that there is no interference with or blocking up of any of the necessary openings in the rooms. Not uncommonly, in blocks of flats only recently built, rooms intended to be used as sleeping apartments are found which are so narrow that when a bed is introduced it must be pushed close up to the wall, and the door cannot be opened properly or the window not at all. The fireplace, too (though in such rooms this is unfortunately sometimes omitted) is usually crossed by the bed no matter how it is placed, and its use as a place for a fire and its value as a ventilator greatly interfered with. The reason why badly-shaped bedrooms are so frequently found is probably because planning of the rooms is carried out without any reference to the use to which they are to be put, though in "made down" houses, *i.e.* houses originally intended for one family only but split up to accommodate more than one, rooms never meant for sleeping purposes are required to be so used. The matter of shape is a very important one, and deserves serious consideration.

Effects of Unsuitable Sleeping Rooms.—The effects produced by an unsuitable sleeping room are those traceable to an insufficient supply of pure air and disturbed rest. The person condemned to sleep in an overcrowded room, in a room so badly ventilated that the air in it is vitiated by excessive heat, by dirt or harmful gases, &c., or in a room where peace is disturbed by noises from without, rarely has the sensations or shows the signs of perfect health.

He is practically never fresh; he becomes bloodless and pale; his eyes are sunken and dark ringed; he is listless; his nervous system is upset, and his liability to disease is increased.

In children more especially are these signs and symptoms marked. Dull, pale, sunken-eyed, listless, rickety, liable to all kinds of infectious illnesses, and always ailing and learning only with difficulty—such is the child whose hours of sleep are passed in unsuitable surroundings.

Improve the sleeping room conditions and an effect almost magical results. The outlook at once improves, and with it the intelligence and the health, and the child is given a chance to grow into an efficient and valuable member of the community.

Water

The three great essentials of the healthy life are air, space, and water.

Everywhere in nature these are freely provided, and every human being is entitled to as much as he shall require of each. They are part of his birthright.

With the spread of civilisation and the formation of communities of human beings for mutual protection and other purposes, there has appeared more or less of a necessity for a dividing up or sharing of many things, and many have had a price placed upon them. Even air, space, and water have had to be doled out, and each individual is required to pay for his share. This is, of course, quite unnatural, but so long as the share of each is a liberal one and sufficient for his needs, no exception can be taken to it.

In preceding chapters the two first-named essentials—air and space—have been dealt with. There now remains to consider the third, viz. water.

Without water the body cannot carry on its functions for any length of time. It enters into the composition of every tissue of the body, no less than 75 per cent. of the human body being made up of water. It plays a great part in every duty performed by the body; it keeps the blood fluid, it helps to wash away the waste materials produced by the various organs and tissues while performing their functions, and it helps to keep the body temperature steady.

The quantities required for these purposes are taken either in the form of water simply or along with the food, water being part of all foods, solid or liquid. No matter how it is taken, however, it must be sufficient in amount and it must be pure.

Because it forms so great a part of the body, and is continually being given off or broken up in the working of the body, the amount required is considerable.

For cocking purposes each adult, it is stated, requires daily about three-quarters of a gallon, and for drinking at least one-third of a gallon. The absolute minimum required for nutrition of the body is probably from four to five pints.

Essential as it is for the internal economy of the body, the requirements of the human being from water do not stop there.

That it is necessary for the cleansing of his body, for the cleansing of his surroundings, and also for the carrying out of most of the processes whereby other necessities of life are produced or obtained, is of course well known.

In calculating the amount required by each person it is usual, therefore, to take these other uses into consideration.

In large communities the plan commonly adopted by those responsible for making provision for the needs of the community as regards water is to set aside for each individual a daily quantity which will cover all uses, personal and general. For personal use, cooking, washing, &c., the average total amount set aside is generally 12 gallons per head per day. For use in connection with sanitary conveniences, baths, and so on, another quantity not less than 10 gallons is usually considered necessary, bringing the total up to 22 gallons.

To provide for other than purely individual uses, such as cleansing of the community, and trade and manufacturing processes, at least another 10 gallons are set aside, and then to cover waste, since unfortunately waste is practically unavoidable, another 3 gallons are allowed per head.

The grand total per head, therefore, in any community should be at least 35 gallons per day. When this provision is made, it is taken that there need be no fear of any person going short of water, and though one individual may use more than his share it is unlikely that all will, so that the balance will be fairly well kept. That a supply anything like so great as this is uniformly made throughout Great Britain cannot, of course, be believed. In some districts, and even some small towns and urban districts, nothing like it is given. Rural districts are the worst, and when all water has to be pumped by hand, and even carried long distances, the quantities used are very much more like the absolute minimum first stated.

The dangers of an insufficient supply of water are so well known that it seems hardly necessary to refer to them. The individual deprived of water inevitably dies after a shorter or longer period, partly because he is starved, partly because he is poisoned by the waste and poisonous substances produced in his own body.

On a diminished quantity of water life can, of course, be maintained, but here again there is partial starvation, partial poisoning, and a reduced resistance to disease.

This reduced resistance is partly produced because of the dirt which collects inside the body, but to a great extent because of that which forms outside and cannot be removed.

In water famines in communities the danger is always from the dirt and the diseases which arise and flourish amongst it. Practically any disease can get a foothold under such circumstances, dirt diseases, typhoid fever, diarrhœa, typhus fever, and so on, more especially. The spread of these is favoured by the lowered health of the members of the community, and largely also by the fact that, where water is scarce, there too is it likely to be impure.

Purity of Water.—Important as is the necessity for a sufficient supply of water, and great the dangers to health of an insufficient amount, infinitely greater is the necessity for a pure supply, very much greater the dangers to health from an impure supply.

Water is, of course, a chemical substance consisting of a combination in a liquid form of the two gases hydrogen and oxygen. The original source of the water which is drunk and used is the rain which falls from the clouds, whether as rain, hail, snow, or dew. At the moment it reaches the earth, though it may have acquired some slight impurities—dirt, germs, and possibly chemicals—in its fall, it is to all intents and purposes quite pure, and a mixture of hydrogen and oxygen mainly.

It is after it has fallen and has formed or has gone to assist in the formation of lakes, rivers, springs, wells, and so on, from which the water to be drunk by human beings is derived, or between the lakes, &c., and the human being, that the water picks up its impurities and becomes contaminated and dangerous.

Briefly, the chief contaminating agents are mineral matters, organic matters, and germs.

Mineral Matters.—The main source of the mineral matters which are added to water is the soil through which it passes on its way to form whatever body of water it is to join. What the substances shall be depends very much upon the character of the soil through which it percolates. If the rocks and so on contain lime, then the water will dissolve some of that and take it up, and so with magnesia, with iron, and so on. Lime and magnesia are perhaps the commonest minerals, but they are not the only ones.

Waters containing soda, especially in the form of chloride of soda or common salt, are not unknown, and such metals as iron, lead, zinc, copper, even arsenic may sometimes be found. In the majority of cases these are not picked up by the water in its natural state, but during the process of storage and so on—lead, for example, coming from the water pipes in which it flows or the cisterns in which it is stored.

Upon lime and magnesia depend the qualities of water known as "hardness" and "softness," waters containing them in an excessive amount being hard, those holding only small amounts being soft.

The extent of the hardness of the water depends upon the amount of lime and magnesia present, and the form in which they occur.

A water which may be classed as average, from the point of view of hardness, is one containing from 8 to 10 grains per gallon. One containing 20 grains is an extremely hard water. A soft water is one with 3 or 4 grains or less per gallon.

On the form in which the minerals appear depends something more than the extent of the hardness, viz. its permanency. The forms in which the minerals appear most commonly are carbonates, chlorides, nitrates, and sulphates. The carbonates are formed by the union of the lime or other mineral with carbonic acid, and when they are present in water they are usually held in solution by carbonic acid. If a water containing carbonates of lime and magnesia and carbonic acid gas is boiled it becomes much softer, because the carbonic acid is driven off and the carbonate falls out of solution. Because softening can be brought about in this way the hardness is said to be temporary.

The fur which forms in kettles which are used for boiling water for domestic purposes consists of lime very largely, and is there because in boiling the carbonic acid has been driven off and the carbonates have deposited.

A similar action to that produced by boiling can be brought about by adding lime water to the water. This unites with the carbonic acid, and again the carbonate falls out of solution and forms a deposit.

For domestic purposes a temporarily hard water is, of course, better than a permanently hard one. The hardness in a permanently hard water depends upon the presence of the other salts of lime and magnesia mentioned above, and may also be produced by iron or alum in one form or another.

When a water is hard, nearly always, part of the hardness is due to permanent and part to temporary hardness. The permanent hardness is difficult to remove domestically.

As a drinking water one which is slightly hard is generally preferred, being usually bright and sparkling both in appearance and to taste.

The chief objection to a hard water is, of course, that it is uneconomical to wash with. It is difficult, as is well known, to produce a lather with soap in hard water, and as a matter of fact the testing of waters for hardness is carried out by means of soap, the degree of hardness being stated in terms of the amount of soap required to produce a permanent lather.

In the house, so far as testing is concerned, whether or not the water dealt with is hard or not is usually soon discovered when washing is to be done and the kettles begin to show furring.

From the health point of view an excessively hard water is not free from objections. Chiefly it is apt to interfere with digestion, and to give rise to dyspepsia and constipation. A water which is hard because of the presence of iron—chalybeate water—causes similar symptoms, but many people suffer severely from headaches when compelled to drink waters containing iron.

Soft waters are soft because they contain the minerals mentioned above in small proportions. Rain water is the typically soft water, and it is largely because soft waters are better for certain domestic purposes, *e.g.* washing, that in country districts the rain water is collected. In some places, of course, the rain water is collected for drinking purposes as well, but great precautions are necessary in carrying this out, more especially in choosing the surfaces from which the water is to be taken, since from these contamination may be picked up, *e.g.* in the shape of dust, dirt, and bird droppings. In town rain water is rarely collected for any purposes, since the rain has usually taken up dust and possibly also gases, such as those coming from factory chimneys, from the air, and dirt of various kinds, from the roof and other collecting surfaces.

Useful as it is for domestic purposes, rain water is apt to be somewhat mawkish in taste. This is largely because it is soft.

Soft waters which are derived other than directly from rain, are soft because they have not taken up minerals from the soil to any great extent.

Next to rain water the softest are what are known as "surface" waters, especially those found and often collected in what are called "uplands," open moors, and so on. Surface waters from cultivated lands are also usually soft.

Though soft waters do not contain minerals such as lime and magnesia in any quantity, there is one metal which they may and sometimes do contain, especially in communities where there is a system of storage and distribution of water. This metal is *lead*, and there are many instances recorded of serious lead poisoning having occurred as a result of the soft water having dissolved the lead with which it has come in contact in pipes and cisterns.

Soft waters from peaty districts are especially apt to exert this action on lead, and this is because they have been found to contain an acid which comes from the peat. Certain towns have suffered from such acid-containing, peaty waters, and have had to take action to prevent the lead being dissolved and people poisoned. What is usually done is to add alkaline substances, such as soda, to neutralise the acid. This plan is adopted in some towns in the Midlands of England. The symptoms produced by taking lead into the system in small quantities for a length of time are often very indefinite, but there is generally a gradual undermining of the health, headaches, constipation, sometimes colicy pains, tremors in the hands, possibly paralysis of one or both wrists, a sweetish metallic taste in the mouth, and a blue line on the gums immediately below the teeth in the lower jaw and above them in the upper jaw. Very serious affections of the nervous system, with marked paralysis, may occur if the lead is taken and absorbed into the system for a long time.

As showing that the lead comes from the pipes it has been found that the water first drawn from the taps in the morning usually contains the metal in greatest amount. It is usual, therefore, to advise in towns where the water is known to have acted on lead that, in the morning especially, it should be allowed to run from the taps for a few minutes before any is used for drinking or cooking purposes.

Besides acting on the pipes, a soft water may act on lead in cooking utensils. It has been shown in several cases and in a number of towns that water left for any length of time in a saucepan or kettle in which it has been boiled can take up a certain amount of lead.

This is an added reason for always filling a kettle afresh before placing it on the stove to boil.

A water containing lead has usually a somewhat sweetish taste, although it may not be sufficiently distinct to be noticeable.

Hard waters do not act on lead; more usually they tend to form a deposit of lime, &c., in the interior of pipes and cisterns, which prevents the water coming directly in contact with the metal.

One disease which is sometimes stated to be associated with soft waters is one affecting children, viz. rickets, in which there is delayed development, and weakness and deformity of the bones. In Glasgow, where rickets is common, the water is generally blamed. But water is not entirely at fault. Rickets occurs amongst children who are starved of food and starved of sunshine and fresh air. In all probability, if a child is well fed and well cared for, and not housed in an overcrowded tenement, it will be able to resist any possible influence which the water may exert in the direction of producing rickets. Bone may be formed and strengthened by the minerals in water, but it is doubtful if it is to any extent.

Organic Matters.—The organic matters which may contaminate water it either picks up itself from the surfaces upon which it falls or receives while it is flowing to the places where it is to collect or after it has collected.

Falling on a roof it may pick up the contaminations already mentioned; falling on soil, it may pick up any kind of contamination—manure, and so on. Flowing over the surface of the ground, it may be contaminated in the same way, and flowing along in a channel above or below ground as a stream or a river it may have passing into it contaminating substances which have come from collections of manure, from cesspools containing excreta of all kinds, or from drains or sewers which are so defective as to allow their contents to escape.

When collected in rills, lakes, reservoirs, and so on, it may be contaminated in the same ways.

The organic contaminations of water are by far the most important. The chief part of any chemical examination made of water is to determine whether or not organic impurities or anything suggesting them are present.

Their presence suggests always contamination with sewage or filth, and when there is contamination with these there is usually always also contamination with germs.

Germs.—In nature there practically does not exist a water which does not contain germs. In its passage through the air the rain picks up a certain number, and when it has reached the earth it continues to pick up more and more practically everywhere it goes.

Only exceptionally are the germs picked up harmful germs. The usual run are quite harmless, but that some may be dangerous and may give rise to disease is a matter of great importance.

The number in which germs may be found in water varies very much. Even a quite good water may contain many hundreds in a tiny drop.

The water which is quite unfit for domestic purposes is that containing harmful germs, and it is not always possible to say that these are present merely because there are a great many germs in the water.

The most important harmful germs that may be found in water are those of typhoid fever, cholera, and those capable of causing diarrhœa and dysentery.

In this country, of course, cholera and dysentery are practically unknown, and the germs which have chiefly to be guarded against are those of typhoid fever and diarrhœa.

It is to prevent the access of these that, in communities, great precautions are taken to protect the water while it is being collected, after it has been collected, and before and during the time it is being distributed to the people who are to use it.

It is for the same reason that persons who get their water from other than public supplies—from, for example, wells, springs, streams, and so on—should take great precautions. The precautions which those who serve a community take are, to choose the source of supply carefully, to collect the water carefully, to store it properly and safely, to clean it carefully by filtering it before sending it out, and to send it out only in clean ducts which are so sound that the water cannot get out and nothing can get into the water.

Similar precautions should be taken by the person who looks after his own supply, and what follows here applies to the collection on a small scale as well as to the collection on a large scale.

Source of Supply.—In the case of the person who makes provision for himself or those who make provision for a community, the source of supply may be rain, wells, springs, streams, rivers, or lakes, either natural or artificial, in the form of reservoirs.

Rain as a source of supply is not particularly satisfactory in either case. If there is no other, then the matter which requires most particular attention is the provision of a proper collecting surface. This must be sufficiently large, and it must be clean. In the case of individuals the usual surface is the roof, in the case of the community usually special tanks are built. From the roof or the tank the rain collected is carried to some tank or cistern for storage. Usually, especially in the individual supply, the first quantity of water is, because it may be dirty, not allowed to enter the storage tank, and an apparatus which mechanically separates the bad from the good is sometimes employed. The storage tank in some country districts is simply the old wooden rain-water barrel. This is rarely satisfactory, as it is commonly left open to contamination, and in the warmer southern parts of England may be a breeding-place for mosquitoes.

Because it is not always possible to be certain about either the sufficiency or purity of the water, rain collection is not to be regarded as a satisfactory way of providing a supply.

Wells are much more commonly found as a source of supply of individual houses than as sources for a community. They are used occasionally for communities, of course, generally as part of a supply, the water being pumped from them to tanks or reservoirs, whence it is distributed by gravitation.

For individual supply in country districts water is derived from one or other of the two classes of well, the *shallow* and the *deep*.

Though these names are given, it is well to remember that they bear no relation to the actual depth of the well. It is a matter of geology rather than depth, the shallow well being one, the bottom of which is above the first impermeable layer of rock, soil, and so on, through which the well is sunk, the deep being one passing below this layer.

Of the two the deep well is infinitely to be preferred, because the water obtained from it is likely to be much purer than that from the shallow well. The water in the latter is liable to be contaminated by the drainage from the surrounding soil, and if there are leaky drains or cesspools or manured fields, the matters escaping from them may filter through the soil and, there being nothing to stop them, they may flow into the well.

In the case of the deep well this is less likely to happen, since the material of which the impermeable stratum is made up keeps back everything, and moreover, the water having had to come some distance, it is likely to have been purified in its passage through the soil.

If a shallow well, or indeed any kind of well, is to be depended upon as a source of supply, every care must be taken not only in choosing the spot where it is to be sunk but in constructing it also. If it must be sunk near cesspools and such like, it should always be placed above them, *i.e.* the fall of the ground should not be from the cesspool to the well but away from it. The well, too, should not, as is so often the case, be just outside the door of the house, but if possible at least 20 feet away from it. The water which is obtained from wells should come from as near the bottom as possible, therefore the walls of the well should be strongly built to keep out water coming in from too near the surface. Further, to prevent the objectionable matter from the surface being kicked into the well, the walls should be carried above the opening in the ground. Sometimes, instead of building the wall up, the top of the opening is merely surrounded with cement or concrete, which is given a fall away from the opening. If the water is not pumped from the well to a storage cistern it should certainly be pumped by hand: the old-fashioned picturesque method of dropping a pail into the water is bad, as other things may be introduced in addition to the pail, and so lead to contamination of the water.

Usually a water from a well, whether deep or shallow, is rather hard, though it depends very much on the character of the soil through which the water passes.

In shallow wells, in order to provide more or less of a filter for the water, it is sometimes recommended to throw a quantity of clean sand and small stones into the bottom.

Springs are produced by the water which has passed down from the surface getting into a position that it is forced up through a crack in the soil. Sometimes such springs come from quite near the surface of the soil, sometimes from a long way down. The water of surface springs is always more or less doubtful in character, and sometimes ceases to flow: deep spring water is usually pure, and more or less permanent.

Springs are occasionally used for the supply of individual houses, rarely for the supply of a community. In the former case a pipe should be provided and a basin built, so that the water has something to discharge into.

Streams and Rivers are, of course, commonly used both for individual houses and communities. They are the natural drains of a country, and are apt to receive objectionable matters. If there are many houses and such like above the point at which the water is to be taken, the possibility of contamination must not be lost sight of. When they are used as sources of a town's supply the water is, or should be, purified before it is distributed for drinking purposes. Some such form of treatment as is to be described presently may be necessary in individual houses. As a kind of safeguard, however, the water should always be taken from as near the middle of the stream or river as possible. River water is usually somewhat softer than that from springs or wells.

Since *lakes*, whether natural or artificial, are simply collections of river or stream water, their contents are much the same as those of the river or stream. The same precautions are to be exercised in connection with them also before they are used. It should be remembered, however, that there is a tendency on the part of water when it is stored to undergo a certain amount of natural purification, becoming clearer and getting rid of a number of germs. This purification is taken advantage of in a number of communities, *e.g.* in London, large artificial lakes or reservoirs being formed in the open country, and the water allowed to stand in them for weeks before being treated and distributed.

In forming and in collecting such sources of supply as reservoirs the greatest possible care is generally—indeed must be—taken.

If a large natural lake cannot be obtained, such as has been done by Glasgow (Loch Katrine) and other communities, a large tract of open country, moorland if possible, is taken, and preference is given to one upon which there are few or no dwellings. This is called the catchment area. Then the largest of the streams in this area is chosen, and a dam is built across it and the valley through which it flows as near the outlet of this as possible. All round the valley strong walls are built until a complete lake is formed. The water enters the reservoir from the river and its tributaries, by which it is collected from the catchment area, and leaves it by the pipes or ducts which lead the water by way of the filter beds, and thence to the houses, and so on, that make up the community.

Purification of Water.—Though care in choosing the source of supply, and in connection with collection of water, will go a long way towards ensuring its purity, something more is generally considered necessary.

In schemes for supplying communities there is generally introduced a system of purification, and quite a number of methods are recommended and used.

Perhaps the commonest of all is filtration, and as judged by the results obtained by examination of the water for bacteria after it has passed through the filter, and the fact that, in the communities in which it is in vogue, such diseases as typhoid fever are rare, it is a perfectly satisfactory one.

The usual type of filter is one consisting of a layer of sand of a depth of 2 or 3 feet, supported on a bed of stones. The water is turned on to the sand, and allowed to pass slowly through it. In its passage it is purified not only by actual filtration but also, it is believed, by the action of something living in the filter, possibly plant life.

In such filtration, all disease germs are removed, those that eventually pass through being of a harmless kind.

As already mentioned, in some places before the water is filtered, it is stored for several weeks. This brings about more satisfactory purification than mere filtration, and certainly leads to the disappearance of the germs of such a disease as typhoid fever and others, which may have been added by sewage contamination.

Instead of, or in addition to, filtering the water, sometimes chemicals are added. The object of this addition is to kill off disease germs, and is generally successful.

Distribution of Water.—After the water has been purified by filtration or otherwise it must be distributed to the houses making up the community. This, as far as possible, is or should be done in closed pipes, since it is not desired either that the water inside should escape or that anything from outside should get into the water. The pipes must, therefore, be strong, and if made up of lengths these must be jointed firmly together. The pipes that carry water through and under the streets are generally made of iron, the separate lengths being jointed together with lead. The jointing is very important, because running alongside the water mains there are the sewers, the gas mains, and so on, and if there should be any leak from these the soil will become impregnated, and the rush of water in the water main is quite capable of sucking in materials, gas, &c., from the soil.

Instances of contamination occurring in this way are not unknown.

From the water mains the water is distributed by means of service pipes to the various houses. The pipes used for this purpose are usually of lead, because lead is easy to work with and can be twisted about and carried easily into all sorts of out-of-the-way corners.

When the water once passes into the service pipe the responsibility for looking after it and keeping it free from contamination passes into the hands of the individual. As delivered into his hands the water, in practically all communities, is pure and wholesome. In some cases, of course, there may be a risk, with a soft water, of action upon the lead of the pipes. This risk is usually, however, recognised by those responsible for distribution, and is met.

Domestic Storage of Water.—A question that has sometimes to be met is that of storage of water in the house. Some water companies and authorities insist that there shall be storage, that the supply shall be intermittent instead of continuous, and that water for all domestic purposes shall be drawn from a cistern.

The usual reasons given for this are that if the supply is continuous there is great risk of waste, and that it is better conserved, and there is less risk of a house going without if the water is turned off for any reason at the main, if a cistern is provided in each house.

These risks, it may be said, are generally regarded as exaggerated, but if a cistern is insisted upon it should be properly constructed, properly covered to keep out dirt, &c., conveniently accessible for cleansing, and regularly and thoroughly cleansed. The cistern may be made either of slate or lead or galvanised iron. Slate is generally not good, as it is apt to crack, and the iron cistern is generally preferred. A lead cistern is, unless the water is very liable to attack the metal, quite safe. Whatever material is used, the other points referred to above, the proper covering, the convenience of access, and the regular and thorough cleansing, must never be overlooked.

In connection with cisterns it should be pointed out that an overflow pipe is usually provided. This should be made to discharge in the open, so that an indication may be given when anything goes wrong with the valve or other apparatus connected with the supply. It should never be taken into another pipe, certainly never into a drain.

No matter what system of distribution is in vogue—the continuous or intermittent—there should always be at least one tap in the house which draws water direct from the main for drinking purposes. Cisterns are so apt to get dirty, and so apt to be neglected, that this is very important.

Even where the supply is continuous there should be small cisterns for use in connection with each of the water-closets, and one also for the supply of the boiler which provides hot water for the house.

In connection with hot water there is one point that should be mentioned, and that is that servants especially are apt, because it saves trouble, to fill tea-kettles from the hot-water taps. Because this water comes in the first place from a cistern that is commonly neglected, and in the second, the hot water, being softened in boiling, may attack the lead of the pipes, this is bad, and should not be allowed.

Domestic Purification of Water.—Although there is every reason to believe that in large communities it is perfectly safe to use the water direct from the main supply without any treatment whatever, there are many who, because they like to be doubly sure, do carry out treatment with a view to proper purification.

When water is derived from a cistern—when, in short, the supply is intermittent—there may be some real necessity for purification. When the supply is obtained from wells or springs or other sources by the individual himself, practically always treatment is necessary, unless the source is very carefully chosen and a thorough examination and analysis have been made, and a very favourable report as to purity given. This domestic purification may be carried out in a variety of ways. One of the surest, of course, is boiling, which, if it is continued for at least ten minutes, will kill all disease germs and probably all others at all likely to be found in water. The chief objection to boiling is, as will readily be understood, that during the process the air is driven off, and the water becomes insipid to taste and less palatable. To overcome this, after the water has been cooled it may be shaken up or poured from one vessel to another several times, preferably through a clean sieve.

Sometimes chemical substances, *e.g.* potassium permanganate or alum, are added to kill the germs. The difficulty with these is the gauging of the amount sufficient to kill the organisms without interfering with the taste of the water. Filtration is probably the most commonly employed method, and a number of excellent filters are on the market. Charcoal filters at one time had a considerable vogue, but the trouble with them always is that they are apt to get dirty very quickly, and to be themselves, if not properly looked after and frequently cleaned by washing with boiling water, a source of contamination.

A form of home-made filter commonly described is one made out of a large flower-pot and a quantity of clean stones and sand. The stones are placed in the bottom of the pot and the sand on top to a depth of from six to twelve inches. Over the sand a layer of filter paper is sometimes placed, and the water to be filtered poured on to this. The water after filtration escapes through the hole in the bottom of the pot, into which is usually fixed a glass tube.

Probably the best filters are those known as the Pasteur Chamberland and the Berkefeld.

These are best used in connection with a water tap, and being fixed in metal cases can readily be screwed on to the tap. They should be removed about once a week, and thoroughly cleaned by washing with a brush in clean water. They should also be boiled occasionally.

No filter, it may be noted, is capable of removing anything but germs and dirt. Metals such as lead are not affected. The most satisfactory (and they are only really conveniently applicable in cases in which the water is driven through them, *e.g.* by pressure behind, as when they are fixed to a tap) are the Pasteur Chamberland and Berkefeld. The former is the stronger and probably the better of the two.

Dangers from Drinking Water.—While the number of diseases which are known to be caused or spread by drinking water is considerable, the majority occur mainly in the tropics.

This country is, of course, not exempt from diseases traceable to water or spread by means of water, but if the source of supply is carefully chosen, and if the water is protected from contamination, and purified if there is any suspicion at all with regard to it, there need be little fear of anything untoward happening.

The diseases and conditions that may be caused are those due to minerals, to vegetable, and to animal parasites.

The effects that may be produced by drinking waters that are too hard or that contain lead or iron have already been referred to.

It has been pointed out also that contamination of water with the germs of cholera, typhoid, or enteric fever, and those causing diarrhœa may certainly occur.

Of the three, typhoid fever is the most to be feared here, and though it is certainly becoming less common, there are still a certain number of typhoid fever epidemics in this country which are clearly due to contamination of water.

With regard to these, it is noteworthy that it is usually in country districts, where the water is not well looked after, that they are found. In towns, nowadays, water epidemics of typhoid are practically unknown, and if there are disadvantages attaching to enforced residence in a town, there is certainly this advantage to the town-dweller, that he can generally drink the water which he draws from his tap with perfect safety.

If he gets typhoid fever, it is usually when he travels abroad or into the country, and, forgetting that he is not at home, drinks the water provided for him in the houses, inns, and so on, or that he sees bubbling up out of the ground or running along as a stream.

An important thing to bear in mind is (and this applies to other conditions than typhoid fever) that the water which is most dangerous and most contaminated may neither look bad nor taste bad.

Indeed a seriously-contaminated water may be noted for its sweetness. Curiously also, it is often the stranger who falls the victim, the native apparently becoming used to the contamination and not being affected by it.

Cholera and dysentery, both water-borne diseases, are practically unknown in this country nowadays, mainly because of the care which is taken to exclude cases from abroad, and because public water supplies are so carefully looked after. None of the other germ diseases common in this country, *e.g.* diphtheria, measles, scarlet fever, &c., are probably conveyed by water.

The animal parasites which are associated with water are in the main worms, and are practically limited to the tropics. The eggs of some of the worms common in this country, the ordinary thread worm and tape worms, can, of course, live in water, and might conceivably enter the human body if drunk after having been fouled by the passage of fresh excreta into it by some one already suffering from the disease. Infection in this way is, however, rare.

A condition known as goitre, in which large swellings form in the neck, and which occurs in Switzerland and elsewhere abroad, as well as in some parts of this country, *e.g.* Derbyshire, is said to be due to particularly hard waters, especially those containing a great amount of magnesia. It seems doubtful if the water alone is responsible for the condition.

In any case, in order to prevent any injury to health from water, the great thing to do is to ensure that it is collected pure and kept pure.

Local authorities, in the vast majority of instances, have recognised the great importance of pure water, and a considerable part of the improvement in health-conditions in this and other countries is traceable to the increased care that has been expended in looking after the water supply.

The individual who provides himself with a water supply should recognise the importance of the water also, and take the greatest amount of care in connection with it.

Drainage and the Removal of Refuse

In the interests of cleanliness, and therefore of health, it is essential that none of the waste matters produced in the course of carrying out the functions and duties of life shall be allowed to remain in the neighbourhood of the individual or his dwelling longer than necessary.

The principal wastes to be removed are those cast off from the interior of the body, viz. the excreta, and those produced by the individual in attending to comfort, preparation of food, and so on.

In the course of removing such wastes care has to be exercised in order to prevent injury to health arising in the process.

Roughly, the wastes to be removed may be classed as liquid and solid; and the solid as those given off from the human body, and those produced otherwise than in the body, the house or dry refuse.

The problem of getting rid of these wastes is one of considerable difficulty, and since neglect to do it properly may lead to serious damage to health, it is also a problem of great importance.

The natural method, of course, is simply to cast the wastes upon the earth and let the soil and the elements deal with them.

In country places this method is frequently adopted where dwellings are isolated and there is plenty of space around the individual houses. The refuse of large communities even, is often eventually dealt with in this way too, but only after it has been taken or carried to a place distant from the community, where there is no danger of the troubles that are inseparable from such a method of disposal, viz. contamination of air and soil, and eventually water.

The difficulty is really a twofold one, for it is necessary to keep the liquid apart from the solid refuse, and may be threefold, inasmuch as some way of dealing with excreta may also have to be found. As a matter of fact, what is usually done with this is to dispose of it separately or to deal with it along with the liquid or the house or dry refuse.

In large communities it generally goes with the liquid, and in small places commonly separately or with the dry refuse.

When either of the two latter methods is followed, what is known as the *Conservancy System* is employed. This is distinctly a primitive method, and is quite unsuitable for large communities. In these that system in which the excreta are taken away with the liquid wastes is the only practicable one. It is known as the *Water Carriage System*, and is only applicable where water is laid on to the houses, where there are closets flushed with water, and where there are drains connected with a sewer, or what is less satisfactory, a cesspool.

This latter system is a sanitary system. The conservancy system is less sanitary, but if proper arrangements are made for storage of the material at a distance from the dwelling, for regular and frequent removal, and for final disposal or destruction of the materials, no danger to health or even serious nuisance need result.

For the removal of the liquid refuse, when the conservancy system is used, drains may also be required. These carry simply clean waste water, water that has been used for washing and cooking purposes, rain water, and so on. They should be constructed in the manner to be described, and should discharge into a sewer, or over the ground, or into a cesspool at a safe distance from the dwelling.

The Water Carriage System.—The water carriage system is a sanitary system because by means of it there is obtained what must be regarded as the ideal in connection with all systems of refuse removal, viz. rapid removal from the neighbourhood of the dwelling.

The matters removed are, of course, only the liquid wastes with, in addition, the excreta. All this is known as *drainage*, the name sewage being usually reserved for the matters carried by the sewers.

The pipes or channels carrying the drainage of the house are known as *drains*, and these make up what is called the *drainage system* of the house.

To prevent nuisance and injury to health certain points in connection with the house-drains and the drainage system require particular attention.

A drainage system is provided with the object mainly of taking the drainage away from the house, so that it shall not contaminate the air and soil, and further of taking it away quickly.

If these objects are to be attained, the pipes and all appliances must be sound and water-tight, and the whole system properly constructed.

In practically all systems there are two parts, viz. that which is below the surface of the ground and which is not seen, and that which is above ground.

Though it is usual to refer only to the former as the " drains," and to regard it as the most important and possibly the more dangerous, the overground portions are equally drains no matter what they carry, rain or waste water—rain-water and waste pipes—or the matters from the water-closet—the soil pipes—and they are equally capable of giving rise to nuisance or injury to health.

In constructing a drainage system it is essential to ensure that whether the pipes are above or below ground they give a straight run for the drainage, and take the shortest and the most direct route to their destination.

In the case of the overground pipes this is the nearest point in the underground portion of the system. In the case of the underground portion the end point is the sewer or the cesspool.

No obstructions, other than those that are absolutely essential, must be placed in the way of the flow of the drainage.

On the contrary, the pipes should be made absolutely smooth inside, so that the contents shall flow along with as little friction as possible, and advantage should be taken of the tendency of fluids to flow best downhill by giving the pipes an inclination or " fall " to their outlet.

The pipes above ground should be vertical, the pipes underground should slope from the point at which they commence to the point at which they end.

The principal pipes to be provided overground are that which carries the various matters from the water-closets; that which receives the rain water falling upon the roof; and that which takes the waste waters coming from sinks, lavatory basins, and baths. In some places one pipe is allowed to take both rain and waste water; nowhere is the soil-pipe allowed to take any other form of drainage, or to be connected with any other overground pipe. All these pipes should run as straight as possible down a wall of the house.

The underground drains to be provided are made up of the pipes (branches) which receive the material brought by the separate pipes provided overground (the soil pipe and the rain-water and waste-water pipes), and that formed by the union of these branches (the main), which carries their combined discharge to the sewer.

Wherever possible none of these drains, overground or underground, should run inside the house. The soil pipes, the rain-water and waste-water pipes, should be fixed to the outer face of the wall; the branch and main drains should run alongside, not under the house.

Unfortunately, especially in towns, where land is valuable and houses have been constructed in rows or terraces, it is often impossible to arrange for the main drains, and even the branch underground drains, to run otherwise than through and under the house. In the same places also, it is often found that the only possible route for some or all the overground pipes is down through the inside of the house.

When such is the case, then particular care must be taken to see that the construction of the pipes is absolutely perfect, and if this is done, and the rules to be afterwards referred to are properly carried out, there need be no fear. If it can be avoided, however, a house which has any considerable portions of the drains in or under it should not be taken unless a guarantee is given that the drainage system has been properly constructed and is sound.

With detached or semi-detached houses it is generally quite easy to arrange to have all drain pipes overground or underground outside.

In constructing the underground portions a sound and safe drainage system can easily be obtained by carrying out certain rules. Some of these rules, in the case of communities, are laid down by the authorities responsible for the care of the health of the community, others are directed by common sense. Compliance with the former is compulsory by law, compliance with the latter is compulsory also if regard is to be had to the use to which the drains are to be put.

For convenience in construction, drains are usually made up of a series of pipes varying in length. The materials of which these pipes are made must be non-porous, *e.g.* iron or glazed earthenware or stoneware. In order to permit of the separate lengths of pipe being conveniently put together, each is provided with a socket on one end. Into this the unsocketed end of another pipe fits. It is not sufficient, however, in laying a drain merely to slip the unsocketed end of one pipe into the socket of the one next to it. The drain must be made water-tight, and the two ends must be firmly fixed or jointed together. It is, as a matter of fact, at the joints that the greatest risk of leakage arises, and every care must be taken to see that the joints are properly made. In the case of iron pipes, molten lead is usually employed for the purpose, and in the case of the glazed pipes, cement. The making of a lead joint is a matter calling for training and knowledge, and iron drainage is generally, therefore, more costly to put in than glazed earthenware or stoneware. The additional money is, however, well spent, and a good iron drain, even when it runs under the house, can be absolutely relied upon, provided it is properly made and laid, and is of a proper size and is given a sufficient fall.

The *laying of the drain* is a matter of great importance. Because of the presence of the socket at one end it is not sufficient simply to dig a trench and lay the pipes in. A firm foundation or "bed" must be provided, and this is usually done by laying down concrete (which consists of cement and pieces of stone, gravel, &c.), and making hollows to receive the sockets.

This bed, too, must be given a slope or fall in the direction in which the drainage is to flow, *i.e.* towards the sewer or other outlet.

The amount of the slope provided depends primarily on the size of the pipes used, and the size of the pipes depends upon the amount of fluid to be carried, on the size of the premises, and the number of water-closets, baths, sinks, &c. Formerly the general view was, the bigger the drain the better. Nowadays, however, the aim is rather to use the smallest pipe possible, so that the fluids shall fill and flow through the whole pipe and scour it out, not merely run along the bottom. In running along a certain amount of splashing is certain to take place, and matters that may decompose are left behind, never to be washed off.

For the run of houses a drain with a four-inch bore is quite large enough, and the fall necessary for this is at least 1 in 40. For five-inch pipes, a size commonly introduced when iron is used, the fall may be 1 in 50, and for six-inch 1 in 60.

The bed of concrete laid down is usually at least six inches deep, and in order to further protect the drain and to prevent it from fracture it is generally required that it be covered in with concrete to a similar depth. With the glazed pipes, more especially if the drain passes under a house, this is a very necessary precaution: in the case of the iron pipe, though it is sometimes done, it is less necessary.

Another very important point to attend to in relation to the underground drain is the connection with the main of the various branches.

In any case they should not enter square, but should form more or less of a V, the point of the V being in the direction which the flow takes in the main. Moreover, it is very much better, though special pipes to receive branches are made, not to use these, but to provide for as many branches as possible joining at one point, and to make there what is called a "manhole" or "chamber."

This consists of a brick-built pit, through the centre of which the main drain runs, and through the sides of which the branch drains open.

One of the difficulties with junctions between branch and main drains is that it is at these blockages of the drain takes place, and by providing the chambers this risk is greatly minimised. The trouble of digging up the ground to clear away the obstruction is also done away with, because the chamber has for its top an iron plate which a man can readily remove, and in addition is of such a size that a man can get his arm, if not his body, into it.

Both the main and the branches, once they pass into the chamber, cease to be pipes, and become merely open channels with glazed surfaces. This permits anyone making an inspection to see exactly what is passing through, and also simplifies cleansing of the drain and the removal of obstructions.

The one point in connection with the manhole or chamber that must be carefully attended to is the cover. This should be of iron, and should be carefully sealed down.

Manholes are very commonly used, and special covers are made for the purpose of covering them, the material used for sealing these down being grease, which is melted before being poured in, and afterwards solidifies to form a gas-tight joint.

Before passing to consider the overground drains and the method in which they reach the underground drains, a word must be said about the method of connecting the main drain to the sewer. Generally this is done by piercing a hole in the wall of the sewer and building into this a socket, into which the house drain is jointed with cement. Very frequently the socket is provided with a metal flap which opens towards the sewer, shutting when nothing is flowing through the pipes, to keep back gas, and possibly also rats, which might enter the drain from the sewer.

To act as a further protection from these there is generally provided (though there are many who doubt the necessity and wisdom of doing so) what is known as an "intercepting trap" or "interceptor" on the house-drain itself.

Some reference is made to the subject of traps in discussing the question of water-closets in a later chapter, and at present it is not necessary to say much more than that the interceptor consists of a pipe bent on itself so as to provide a kind of cup in which water will lie. The primary object of the retained water is to keep back gases and to shut off the sewer from the main portion of the house-drain. As it may happen that that portion of the drain between the trap and the sewer will get blocked, means of getting through to this are provided by connecting a piece of pipe to the far side of the bend and carrying it back to open above the entrance to the bend. This pipe is called the "clearing arm." The usual method of dealing with the interceptor is to place it so that the drain enters it at a "chamber" similar to that already described.

This chamber is sometimes called the "disconnection" or "intercepting chamber," and is placed at the front of the house. It allows of the clearing arm (which, like the trap, is built into the front wall of the chamber) being easily reached if need be.

If there are any branch drains in the front of the house, they can conveniently be connected up with this intercepting chamber.

In connection with it there is another appliance, viz. the fresh air inlet, to which reference will be made when considering ventilation of the drain.

Since the risks of gases passing backwards into the drains from a cesspool are greater than in the case of a sewer, a drain connecting with a cesspool must always be intercepted as described.

Sometimes, instead of joining all the branch drains of a building into one main drain, two mains are provided, the branches carrying soil from the water-closets and those carrying rain and waste waters being kept separate. In some cases such an arangement is rendered necessary by the fact that the sewers provided are not sufficient to carry all the drainage; in others, especially in country places, it is done because the waste waters are discharged into a stream or elsewhere, while the excreta are taken to a cesspool. Whatever arrangement is adopted, the drains must be laid in the manner described, and the same remark applies to those houses in which the conservancy system is adopted in connection with the dry and the excreted refuse, and drains are only made to carry the waste waters to a cesspool or to discharge into or over the land.

The Overground Drains.—The overground drains should be placed against an outer wall of the house; and should run as straight a course as possible, without twists or bends, to the point at which they are to join the underground portion of the system.

Further, they should be sound and well constructed. The pipes are required to carry the excreta or soil—the soil pipe; to carry rain-water from the roof—the rain-water pipe; and to carry sink, bath, and lavatory wastes—the waste pipe.

All these pipes should be separate.

The construction of the soil pipe is described in a later chapter, and nothing further need be said on that point here. With regard to its method of joining the underground drain, it should be pointed out that this junction takes place below ground, the pipe running straight into the drain, passing into the socket of a drain pipe, and being fixed there by means of cement. The soil pipe is the only overground drain which actually becomes one with the underground drain.

Drain Ventilation.—Because the soil pipe is so connected it is often made to act as well in connection with the ventilation of the drain.

The part it plays is to serve as an outlet for gases which may be produced in the drain, and in order to ensure that these shall not get into the house the pipe is carried well above the eaves and away from windows. If a soil pipe is unnecessary because there are no water-closets above ground level, a special pipe constructed in the same way as the soil pipe is provided as an outlet ventilator. Generally in order to protect the top of the pipe from nesting birds, it is fitted with a kind of cage. To assist in ventilation it is usual to provide, in addition to the outlet an inlet for fresh air. This is a pipe leading from the disconnection chamber and opening above ground, but in order to ensure that, while air may pass into it, none of the gas may pass out, the top of the pipe is finished off with a kind of box fitted with a delicate flap, so hung that it will open to a draught from without and close if there is a back draught from the drain. This is very delicate and apt to get out of order, and there are some who say that the danger from it far outbalances any advantage, and that the fresh air inlet should be omitted altogether.

The *rain-water pipe* and the *waste pipe* do not pass into the drain, but stop at or near the ground level and discharge their contents into what is known as a "gully," which is part of the underground drainage and has an opening, covered usually with an iron grating, on the surface of the ground.

It is important to remember this distinction between the soil and the other overground pipes.

The principal reason for not carrying the rain-water pipe straight into the drain is that this pipe, which commences above at the eaves of the house, where it collects the rain from the eaves gutters, or rhones, is generally not a very strong pipe, and moreover has no traps upon it. This being so, if it did run straight into the drain it would allow of the escape of gases, and possibly germs from the interior of the drain, and that close to windows.

In the case of the waste pipes, if these went straight into the drain, the traps provided in connection with the sinks, not being very strong ones, would not offer any great opposition to gases passing backwards from the drains, and the air of the house might easily become fouled.

As baths are sometimes not trapped at all, ventilation of the drains direct into the interior of the house would certainly occur if the waste pipes connected with these were carried straight into the drain.

The gully referred to above is a most important part of the drainage system. It is made usually of glazed ware, but sometimes also of iron, and has an inlet and an outlet, the portion of pipe between them being bent to retain water and so form a trap. The outlet is connected into the socket of one of the pipes making up the drain; the inlet is at the ground level under the rain-water or waste pipes, and is guarded with a grid which serves to keep back solid matters from the trap. Sometimes both rain-water and waste pipes open over the same gully, and no objection can be taken to this arrangement. Indeed it is often advisable, because if only the rain-water pipe opens over a gully, during very dry weather the water in the trap may evaporate, and the exhalations from the drain pass into the air.

For receiving the surface drainage from yards and areas a separate gully is sometimes employed, though in small houses it is not unusual to depend upon that receiving the rain and waste waters to remove surface water as well. Apart from this, the modern sanitary type of gully, sometimes others which are not so good and may even be bad, are seen. One form occasionally met with is that known as the Bell trap. This, in effect, is a trap only in name, since the moment the top is removed the trap is broken, the cutting off of the drain from the outer air depending upon the presence of a bell-shaped piece of metal which is attached to the under surface of the top grid.

When this, or indeed any but the modern form of trap, is found in connection with a house, it should be removed, and at the same time suspicions should be aroused with regard to the condition of the drainage generally, since at the time when such appliances were introduced drainage work was not so carefully done as it is now.

Sanitary Appliances.—No less than the drains under- and overground, the sanitary appliances provided for use in connection with them are part of the drainage system, and therefore important.

The chief of such appliances is the water-closet, which is described at some length in the succeeding section. There it is indicated that the chief points to be attended to are in connection with situation and construction of the convenience.

Sinks, no matter where they are, whether in the kitchen, the scullery, or the housemaid's pantry, are also important. By far the best material for the sink is glazed ware, preferably white, because this material is non-absorbent and is easily cleaned and kept clean. To assist in cleansing and to favour cleanliness, the sink should always be placed in a position where there is plenty of light.

In some old-fashioned houses stone sinks are even now to be found. These are bad, and should be removed and replaced by others of the material described. Lead sinks are also sometimes seen, and are often introduced in pantries where much glass or silver is washed. They always look dirty, and the metal tends to wear thin and uneven.

In connection with sinks it is very common to provide a considerable amount of woodwork, and even to arrange a cupboard underneath. This is a bad practice, as the wood is apt to get soaked and dirty and the cupboard to become a receptacle for dirty, and smelly articles. The less the sink is boxed in the better, and the cupboard certainly, and as much as possible of the woodwork, should be done away with. If any is used, however, teak or some other hard wood is to be preferred.

For carrying away the waste water there should be attached to the outlet of every sink, which is at lowest point, a length of pipe which should be carried outside through the wall of the house and made to discharge, if it is on the ground floor, over a gully, or if higher up the building, into a vertical waste pipe.

This length of pipe, which usually consists of lead, because the interior of any pipe carrying waste waters is certain after a time to become fouled with grease and organic matters which decompose and give off bad smells, should always be trapped by bending it upon itself to form something resembling the letter S laid on its side, thus ∽. In order to provide means of access to the interior of this bend or trap, at the most dependent point there should be an opening fitted with a screw cap. This, though it is liable to get out of order is a most useful fitting, as blockages not infrequently occur in the trap, and have to be cleared away.

Further, to prevent what is known as "antisyphonage," or the sucking out of the water from the trap, occurring, it is essential that means of ventilation should be provided in connection with the trap. This ventilation is usually brought about by carrying a separate pipe off from just above the bend of the trap and letting it open in the fresh air. If there is only one sink connected with a waste pipe, this ventilation or antisyphonage pipe opens just outside the wall of the house. When there are more than one, all the antisyphonage pipes are usually collected into one and carried up the wall beside the waste to a point above the eaves.

Lavatory basins should be constructed of the same material and on the same general principles as the sinks. They also should be trapped and antisyphoned where necessary. In some houses it is not unusual, because it is convenient, to place such basins in dressing-rooms and even bedrooms. If this is done, particuar care should be taken in their construction, and they and the waste pipes leading from them should be kept very clean.

The bath is, to all intents and purposes, a large sink. The points which require particular attention in connection with its construction are referred to in the section headed The Domestic Offices.

The hot water for the bath, instead of being obtained from the ordinary hot water supply of the house, is often derived from a gas-heated geyser.

The fact that many deaths have been caused, and considerable damage done to life and property, because the geyser has been improperly used or badly placed, or not provided with a flue, must not be lost sight of.

Sewers and Cesspools.—Because they are of considerable importance from the health point of view, something must be said with regard to these.

The sewers of a community are channels for carrying sewage, and sewage is made up not only of the house drainage, but also of drainage from the streets, and sometimes also from manufactories of various kinds. Sometimes they consist of pipes, sometimes they are built up of bricks. In any case they must be given a fall, and must be laid on a proper bed. Like the house-drains, the sewers require to be ventilated, and the ventilation of sewers is one of the matters which occupies a large amount of attention, and has been widely discussed.

Particular importance is attached by many to the gas which is contained in sewers, and quite a number of diseases and illnesses are and have been attributed to poisoning by "sewer gas." As a matter of fact a large number of investigators who have given close attention to the question of the possibility of injury by sewer gas have at the end of their work been surprised to find that they have been unable to discover anything in sewer gas which would account for any of the diseases and illnesses. The air of sewers they have found to be remarkably free from germs, and in composition not very much different from the air found in houses and elsewhere.

That smells come from sewers is undoubted, and also that some individuals are more liable to be affected by such smells than others is generally agreed. Apart from this, however, science has been unable to discover anything which warrants giving sewer gas such a bad name as has certainly been conferred upon it.

The same scientists who worked at sewer air and gas, examined the air of house drains. To their surprise, they found that it was very much worse than sewer air, inasmuch as it was apt to contain dangerous germs and also to smell badly.

From this they concluded that what the members of the community most required protection against was their own drains, and they advised that these should be very carefully constructed, and, above all, that when they were ventilated the pipes letting air in and out should be placed far away from windows.

Some of these same investigators, because the question of ventilating of sewers is such a vexed and difficult one, went the length of advising that, in order to assist this, the intercepting trap which has already been described as forming part of a house drainage system should be left out altogether, and the air from the sewers should be allowed to escape freely through the outlet ventilating pipe on house drains.

The position taken up by the scientists, from a logical point of view, is certainly a strong one, and it seems probable that provided, as they suggest, the drainage system is sound and proper, no danger will result from the omission of the trap. Indeed it will be an advantage, for, besides being an obstruction to the drainage, this trap often gets blocked up, and actually completely prevents the escape of drainage.

The *cesspool*, which is rarely now seen in towns, is not uncommon in rural districts. Whether it receives all the drainage of the house or only the waste waters, it should be placed as far as possible from the house, and well away from any possibility of contaminating any water. Its walls must be well and strongly built, and it should be covered and ventilated.

A pump is usually required to empty the cesspool, and sometimes one is fixed in connection with it.

Drains discharging into a cesspool should always be provided with an intercepting trap, placed as near the cesspool and as far from the house as possible.

Disposal of Sewage.—In communities the responsibility for disposing of the sewage in such a way that neither nuisance nor danger to health shall arise, rests upon the local authorities, and in the vast majority of cases the system adopted leads to the desired results.

Where difficulty may be and often is experienced, is in the smaller communities and in country districts, where each individual householder may have to attend to the matter himself.

When there is plenty of space about a house, and the owner has funds and is desirous of dealing with the house drainage properly, there need be no difficulty. There are many well-known and quite satisfactory methods that can be adopted.

In the case of small houses, if there is only one house to be considered, the best plan to adopt is to keep the excreta, the liquid wastes, and the house refuse separate. The first-named can be dug into, and the second run on to, land.

If a proper form of closet is used for the excreta, *e.g.* a pail in which provision is made for the application of earth, &c., to the matters deposited, disposal of excreta is greatly simplified. The difficulty comes in then with the liquid refuse and the house refuse. For the former, disposal over land, if it can be arranged, is the best. It should never, where possible, be run into streams or roadside ditches, as is occasionally done. It almost inevitably gives rise to nuisance, and sometimes even to illness.

The house refuse in a single small house should, as far as possible, be burned, and what cannot be disposed of in this way may be buried. Where there are several small houses together, the removal and disposal of this refuse should certainly be carried out by the local authority. If each member of the small community is left to attend to it himself, almost of a certainty nuisance is caused.

Removal and Disposal of Dry Refuse.—In large communities these functions are performed by the local authority. The removal is, or should be, carried out once or, preferably, more frequently in each week, and the disposal at such a place, and in such a manner, as will ensure that the health and comfort of no individual is endangered.

The matter which the individual himself must chiefly attend to (and this applies to every householder, whether his house is in a big community or a small one or in an isolated situation) is proper storage of the refuse.

With the introduction of other forms of cooker than the fire or range burning coal, there has come a great change in the character of house refuse. Materials that were formerly generally burned—remains of food, vegetables, and so on—are now placed with the dry house refuse, and being liable to decompose, and offering a favourite breeding-place for flies, are apt to give rise to nuisance and even to cause disease.

Because of these things it is most important to provide a proper appliance for the keeping of refuse, and to place it as far as possible from the house, and certainly from such parts as those in which food is stored and cooked.

The best form of apparatus for storing refuse is undoubtedly the so-called "Sanitary Dustbin," which is made of metal, is easily movable, and is, as all refuse receptacles should be, provided with a cover.

The wooden dustbin is a very bad form, the built-in dustbin is equally bad. If a built bin is used it should be well and strongly built, it should be lined with cement, floored with concrete, and covered. It should also be provided with a means of access for convenience of clearance.

Sometimes, in country districts especially, the closet is erected adjoining the receptacle for refuse, and the excreta are discharged into it. This is not at all a good arrangement, and if it can be managed the two should be separated, and a movable apparatus provided for the excreta as well as the refuse. In order to discourage the retention of refuse too long in the neighbourhood of the house, since retention allows both decomposition of organic matter and the development of flies, the dustbins provided should not be too large. Certainly they should never be capable of holding more than the amount of refuse that can be made in a week. It is better even to have them smaller, but in communities the size largely depends upon the arrangements made for removal by the local authority. The relation between good scavenging and good health is undoubtedly very close, and money spent either by the individual or by the local authority in connection with the removal or disposal of refuse is well spent.

Dangers from Drains.—It has been said more than once in previous pages that if a drainage system is properly constructed there need be no fear either of nuisance or danger to health from the drains. Good drainage, indeed, is an absolute essential of the healthy life, and in the majority of communities, the larger ones especially, this is generally recognised, and the authorities, in addition to laying down rules which must be complied with in connection with drainage, have appointed experts whose duty it is to go round and see that the works that are done are in accordance with the requirements, and are sanitary.

In communities, however, the houses which are most likely to be provided with a proper and sound system of drainage are the modern houses, those that have been erected since the laying down of the requirements and the appointment of the experts, steps that were taken not a great many years ago.

It is in the older houses that bad drainage systems and unsound drains are to be looked for, and much of the work of the local authorities and their experts is carried out with the object of finding the bad drains and getting them made sound.

Even to the man in the street the dangers that may be expected from bad drains are well known. These dangers arise because the contents of the drains—the fluids, the solids, the gases, and the germs—are not confined to the interior of the drains, but are allowed to escape into the air to be breathed, or into the soil, and so into water or air.

The worst feature of the danger from drains is that, in the main, it is an unseen danger. In the main, too, the harm done to health is vague and indefinite in character.

A drain that is grossly defective, the joints unsound, the pipes broken and leaky, may go on for years in that condition, allowing its contents to soak into the soil close to or under the house. In the soil the organic matters go on decomposing and giving off injurious gases, which make their way into the house to contaminate the air to be breathed by the inmates.

Being largely odourless, the presence of these gases is not detected. Being given off steadily in small quantities, they produce no sudden or marked illness, but a general unwellness, a loss of vitality and of resistance—in a word, impairment of health.

Quite a number of definite diseases are stated to be due to defective house drainage. The majority of these are included in the infectious group, and amongst them may be mentioned typhoid fever, diphtheria, and scarlet fever. Of the possibly non-infectious, sore throat or "poisoned" throat is perhaps the most noteworthy.

That there may be some connection between these diseases and defects in drains seems quite probable. Typhoid fever certainly can sometimes be quite definitely traced to the drinking of water which has been contaminated by leakage from a defective drain. In the others, since the trouble is largely in the throat, it seems not at all unlikely that the germs may come from the polluted soil; but if not, the undermining of the health and the lowering of resistance which result from breathing the contaminated air certainly render the person more liable to pick up infection elsewhere.

A "bad throat" is so commonly found in cases in which defects in drainage have been discovered, that the fact that there is a connection between the two things may be regarded as established.

Dampness in houses, which is so often associated with consumption, rheumatism, and rheumatic affections like lumbago and sciatica, is sometimes produced by leakage from drains. The fluid causing the dampness may come either from the overground or the underground drains. Of the overground drains, though any of the pipes may be responsible, the rain-water pipe is not infrequently found to be the culprit. Quite often this pipe gets blocked either at the top or lower down, by leaves and so on, and the water, overflowing, causes great dampness. A stopped rain-water pipe should be attended to without delay. Regularly also, the eaves gutters leading to it should be cleared out in order to guard against blockage.

To protect himself against the possibility of having his health injured by the drainage system of his house, the individual should take certain precautions. In the first place, before taking a house he should satisfy himself as to the condition of the drains and all sanitary fittings. If he cannot place reliance upon his own opinion in the matter, he should not hesitate to take the advice of an expert. In some districts the local authority is prepared to assist members of the community; and even if they are not, there is never any harm in writing to the health officer and making inquiries with regard to the drains of any house. Private firms, of course, are always ready to make examinations and reports.

If the individual is in residence in a house, and he has any suspicion regarding the drains, either because the appearances or appliances are not such as described here, or because there has been illness in the house, or because rats (which are often found where there are bad drains) have been seen, then he should not delay, or hesitate to communicate with the health officer. Practically in any community it will be found that a sanitary inspector will be sent to make an examination, and if anything is found to be wrong, steps will be taken to induce or compel the party responsible for the upkeep of the drains to put matters right.

Any individual who is building a house for himself should certainly have expert advice with regard to the drains, if not on other points.

It may cost a little more to do so, but it will be found to pay in the long run.

Dangers from House Refuse.—The dangers that may arise from house refuse do so mainly because the material is improperly stored and is kept too long, and is allowed to be blown about by the wind, or to be carried about by the flies which visit it or which are bred in it.

Whether blown or carried, this material may be inhaled or may be deposited upon foods—meat, milk, and so on—and be swallowed.

The fact that flies may act as the carriers of disease germs and foul and objectionable substances is now well recognised, and typhoid and other fevers, and diarrhœa and other diseases have more than once been known to have been brought about through the intervention of these insects.

It is also well known that flies can breed in house refuse, and that they tend to remain near the place where they have been bred.

For these reasons it is important to pay particular regard to the house refuse, its storage and removal.

The tendency of the refuse receptacle to get dirty must be remembered, and it should be scraped out and cleansed from time to time. In summer, in order to prevent the possibility of smells, it is not uncommon to treat the dustbin with a disinfectant.

If the dust is properly stored out of doors, if no improper substances are placed in the bin, and it is regularly and frequently emptied, there should be little necessity for this.

But if disinfectant is used, it should be in the form of a powder such as carbolic powder; no fluid, even disinfectant fluid, should be poured into a dustbin. In any case it is exceedingly doubtful if the disinfectants really do disinfect. They may mask a smell; it is unlikely that they will kill many, if any, germs.

If the precautions mentioned are taken, not only will the need for disinfectants be done away with, but fly-papers and poisons will also become less necessary.

Numbers of flies anywhere nearly always indicate dirt somewhere in the neighbourhood. Instead of trying to kill off or catch the flies the person who is troubled by them should search for the place where they come from. Not uncommonly this will prove to be the dust receptacle. In that case the course is clear, and the suggestions offered above should be acted upon without delay.

Health in the Domestic Offices

The Water-Closet.—Of the domestic offices (and under this head are included the sanitary conveniences, the scullery, and the larder), those to which chief importance is attached are the sanitary conveniences, and though there are other things in and in connection with a house which are equally or even more important, practically always they, and more especially the water-closet, first fall under suspicion if anything goes wrong or is suspected to have gone wrong.

It is for this reason that the water-closet is here considered first. This may give rise to offence, *e.g.* to decency or to the senses, especially the sense of smell; it may give rise to injury to health—sore throat for example—or a disease even, such as typhoid fever.

These troubles arise mainly because the water-closet is badly situated, or badly constructed, or is neglected or misused.

Situation of the Closet.—The water-closet which is badly situated is more likely to be found in the old-fashioned house than in that erected within recent years. In the old days, of course, before the water-closet was introduced and some form of dry closet was in use, it was essential that this should be placed outside.

Not uncommonly, when a water-closet was required, it was simply constructed in the old building, from which the dry closet was removed. This was done partly because it was cheap, partly because there was, and is now, in some places, an idea that no sanitary convenience should be given a place inside a dwelling-house. That an idea such as this should ever have been believed in by anybody is nothing short of remarkable.

If there are any disadvantages (and provided the closet is properly placed, made, and looked after, there need be none), they are far outweighed by the advantages. In cases where there are outdoor closets there is always a possibility that the inhabitants will neglect the calls of nature and so do themselves harm, or that undesirable practices in connection with the disposal of excreta will be adopted and nuisances caused in the house. By far the best and most convenient place for a closet is inside the dwelling, and in the newer houses provision is carefully made for it so that it can be placed where it does not communicate with other rooms and can be entered and used privily.

In the older houses, especially in more congested districts, it is often exceedingly difficult to find a suitable place for a closet. This is why even in some of the grandest old buildings such conveniences are met with in basements, on stair landings, in the middle of the premises, and in out-of-the-way corners where air rarely, and the light of day never reaches. Not uncommonly the difficulties have been so great that they have had to be placed inside rooms, even those used for sleeping purposes.

The modern requirements with regard to water-closets, in addition to those already mentioned, are that they should be well lighted and ventilated, and one side at least should be an outer wall of the house. This completely prevents the bringing of the closet into the middle of the building, a most undesirable position, since lighting and ventilation are interfered with, and there is no office in which these are more required.

These requirements, in most places, are enforceable by law, and anyone failing to comply with them is liable to a fine. If they are complied with a great deal of the likelihood of offence or illness arising is done away with. No one should take a house or remain in a house in which they are not complied with unless they are prepared to take even extraordinary precautions to keep the closet clean; also they should take every care to discover if the drains of the house, the closet apparatus itself, and other sanitary appliances are sound and modern, since defects in these are apt to be found along with them.

Construction of the Closet.—With regard to the construction of the water-closet. This also is of great importance—an importance generally recognised in local laws, just as in connection with the situation of the closet. The great thing to be aimed at is absolute simplicity. The closet-apparatus should be simple to use and easy to clean, cleanliness and simplicity being the watch-words of health.

The modern type of apparatus, as a matter of fact, is one of the simplest things imaginable. To all intents and purposes it is a funnel with the outlet tube bent on itself, so that a certain amount of water will be held in the bend until driven out. The water is held back partly in order to receive the excreta and prevent nuisance from them, partly to keep air and smells from the drains from entering the house.

The force to drive out the water and any excreta from the bend, or as it is usually called, the "trap," is provided by a body of water thrown on to the top of it. This comes from another piece of apparatus, the flushing cistern, which is connected up with the closet apparatus by means of a pipe.

The quantity of water thrown in varies, but is rarely less than two gallons, and it is let go by pulling a chain attached to the cistern, in the interior of which there is a contrivance which leads to another quantity of water flowing in as soon as one has flowed out. This supply should come, preferably but not necessarily, not from the main but from another cistern provided to contain water for uses other than drinking.

In the majority of instances the note of simplicity is still further carried out in the closet apartment by so placing the pan that it is easy to get all round it. In the older forms of apparatus, of which the worst of all was the "pan closet" occasionally even now found in some old houses, this is not possible. In addition to being completely covered in with wood, the pan closet is so constructed that though the excreta disappears from view when the plug is raised, they merely pass out to foul a hidden chamber beneath the pan. As the pan is almost invariably directly connected with the drinking water cistern, the possibilities of interference with the water and of damage to health are considerable.

With the modern type of pan there is usually only sufficient wood provided to allow of the apparatus being used in comfort. An objection sometimes taken to this type of closet is that noise is produced when it is being flushed. To overcome this, various other patterns have been put upon the market. To them, however, there are several objections, viz. that they are complicated and therefore apt to get out of order; that they are more expensive; and that they use a great deal more water for flushing than is at all necessary.

The Soil Pipe.—After the material has been discharged from the bend or trap it passes into what may be regarded as part both of the closet apparatus and the drainage system. This is called the "soil pipe," and it runs from the top to the bottom of the house. To it the closet pan is united by a joint which usually lies to some extent within the building. Because it does so it is of great importance that it should be well made and that it does not leak. Slipshod work is sometimes put into this joint, and some of these troubles—sore throats and so on—that it is difficult sometimes to name or to find a cause for, are occasionally traceable to it.

The soil pipe itself should always if at all possible be placed outside the house, but if it cannot be so placed it should be so made that there is no risk of leakage from it. In London the law is that all soil pipes shall be constructed outside, but if they must be placed inside they must be made of lead, pipes of iron being allowable outside. This requirement was probably introduced with the object of discouraging the construction of soil pipes inside, since lead is more expensive than iron. It is also more durable, and better work is likely to be put into the lead pipe, since only skilled workmen —plumbers—are supposed to be able to deal with lead. One objection urged against a lead pipe is that a nail may be driven into it and leakage caused in this way. This seems rather far-fetched, and can certainly be guarded against.

Neglect and Misuse of Closets.—The points in connection with the situation and construction of closets are certainly important: far more important, however, are those in connection with neglect and misuse of closets. Simple in construction though they be, if they are neglected, not kept clean, or are used badly by having unsuitable materials thrown into them, they will get out of order and give rise to nuisance.

The housewife drawing up rules for herself or her servants should never forget to put in one about cleansing the closet.

Quite commonly the cleansing is done, but it is only the top and sides that are attended to. Fur which readily forms is allowed to collect below the line of the water, and not only looks unsightly, but is apt to decompose and give rise to offensive and even harmful smells. If a brush is used every day the deposit of the fur will be prevented, but if it does form it can be got rid of usually by rubbing with spirits of salt.

Some of the difficulty in keeping the lower part of the pan clean arises from ignorance of its construction. From what has been said it is clear that there is nothing mysterious about it. The water is only clean water, and the hand can with absolute safety be introduced into it and swept all round the trap.

The flushing cistern too should not be neglected. The mechanism sometimes gets out of order, and the water either dribbles away or a bad flush is obtained when the chain is pulled. Very often the man or woman of the family can put the matter right by having a look at the inside of the cistern and making a slight adjustment. If not, then a practical man should be called in, since, though no nuisance or damage to health may be caused, it is undesirable to have an insufficient flush and almost criminal to waste water.

As to the misuse of closets. In an ordinary well-managed house this is hardly likely to occur, but sometimes by maids, or in the poorer localities by children or even adults, pieces of wood, tin cans, toys, cloths, and pieces of coal, &c., are introduced into the pan, and getting a certain way into the soil pipe cause blockage and nuisance. This can easily be prevented, but if blockage occurs it should be removed without delay.

In ordinary circumstances blockage of the trap cannot occur, but if large quantities of paper are put in it sometimes does. If there is any sign or possibility of it the hand should be put into the pan and the obstruction found and removed if possible.

The Bath.—Apart from the closet pan the bath and lavatory or wash-hand basins are sometimes placed in the water-closet apartment. To the association of the bath with the closet some people object, but it is sometimes necessary, in order to save space, to have them together.

Sometimes the same reason that requires that the bath and the closet shall be together, lead to the construction of the former in a bedroom. This is not at all desirable, since when a hot bath is taken, dampness of bed-clothes may be caused by the vapour. A much better position for the bath in such cases is the scullery, and here in many modern workmen's houses it is, as a matter of fact, placed.

The bath, like the closet pan, should be simple. It should not be boxed in, and it should always be possible to get all round and under it for cleansing purposes.

Sometimes smells are detected coming from the outlet of the bath. This outlet communicates with a pipe, called the waste pipe or waste, which sometimes has a bend or trap on it and carries away the waste water. By pouring hot water containing soda through the pipe it is sometimes possible to get rid of the smell, which may be due to soap and grease from the skin catching on the sides of the pipe and decomposing. Very rarely does such a smell come from the house drain, because, as will be explained later, the bath waste pipe is not or should not be directly connected with it.

Lavatory Basins.—What has been said with regard to baths applies equally to lavatory or wash-hand basins. They should not be boarded up, and for the reasons given in the previous chapter, there should be no cupboards underneath them.

The sink should always be placed in as well-lighted a position as possible, since if dirt is seen it is more likely to be removed. The waste pipe of the sink is constructed on the same principle as the bath waste, and may cause nuisance in the same way.

The Scullery.—The scullery is another place that may be classed as a domestic office. It is particularly at the mercy of the servant; it contains apparatus likely to give rise to nuisance, *e.g.* a sink; it is a place into which objectionable articles are likely to find their way—pails, washing-cloths, &c.—and in it tasks are performed such as cleaning of food, fish and vegetables, washing dishes and pots and pans, which may give rise to greasy slops, refuse and dirt. For all these reasons it is a place which should be well lighted and airy, easily cleaned, and thoroughly and regularly cleaned. The sink particularly requires attention. Above all it should not be boxed in, and it should be smooth and light in colour.

The waste pipe connected with the outlet should have a bend or trap on it, and at the bottom of this there should be a removable plug. In most cases the amount of grease and so on which passes into the waste pipe of the scullery sink is considerable, and unless great care is taken blockage may occur or foul smells may escape.

In every scullery sink there should be one of these ordinary perforated trays, and into it everything that is to go down the waste should be poured. It is sometimes recommended that a piece of soda should be placed in this, as this prevents grease and fat settling on the interior of the waste pipe. From time to time, and certainly if smells are given off, boiling water and soda should be poured down the sink waste.

Smells should never be allowed to exist in the scullery. Immediately they are noticed a search should be made to try to find where they come from. All corners should be turned out, and all bundles and collections of things. Refuse, fish offal, and so on, should never be allowed to remain in the scullery for any length of time, but should be burned without delay. Plates, pots and pans containing scraps of food, and so on, should be cleaned as quickly as possible. The thoughts of persons detecting smells almost inevitably turn to the drains, but experience has shown that in many cases the fault lies in something more simple, and the remedy in attending to the cleanliness of the scullery and its contents.

The Larder.—The necessity for a good, well-placed larder is one not infrequently overlooked. In storing food, the aim should be to ensure that it shall be kept cool and free from contamination by dust and germs brought by air or otherwise.

In order to obtain coolness the apartment provided should be placed on the sunless side of the house—*i.e.* the north. In some districts in place of constructing a larder a food cellar is introduced, and this, so long as it is properly looked after, kept clean, and used for no such purpose as storage of coal, is quite satisfactory.

In any case the food store should be well lighted, but dust, and more especially flies, should be kept out. With this object, part of the window should be fitted with wire gauze or perforated zinc. This, in addition to securing that flies are kept out, will at the same time allow of air passing in and so keeping the place fairly well aired. As an additional precaution gauze covers may be provided, more especially for vessels containing milk, which is more readily contaminated than any other form of food.

Storage of refuse anywhere near the food store must, of course, be avoided, since collections of garbage are greatly favoured by flies, both as a feeding and a breeding ground. That dust may be blown from the refuse heap also must not be lost sight of.

As far as possible the food store should be isolated. If it can be arranged it should be entered from a passage and not from another apartment. It should be placed as far as possible from the water-closet.

In some of the houses occupied by the poorer classes no consideration whatever is given to the necessity for storage of food, and too often no larder, pantry, or even cupboard is provided. This is a most serious matter, and often leads to food being stored in most unsuitable places, and where contamination is almost certain to occur.

The Effects of Neglect.—In what has gone before some reference has been made to what may be the results of neglect to attend to those conveniences usually found in the domestic offices. Very often they are of the vaguest possible character.

Some people are much more susceptible to smells than others, and also to those more dangerous emanations from defects in sanitary appliances which do not show their presence by giving rise to smells. In these sore throat is perhaps the most positive indication of poisoning. Others are bloodlessness, loss of tone, loss of appetite, and loss of resistance. These last are perhaps the most important, because the individual thus reduced in health is exposed to risks in the ordinary affairs of life that the average healthy person never encounters. Moreover, since the condition does not suggest to the lay mind anything wrong in the home, the defects are allowed to continue.

The association of sore throat with bad sanitation generally does, however, and usually results in a thorough examination being made, and the probable discovery and removal of the defect. Definite diseases are rarely directly traceable to defective sanitation. Diphtheria is sometimes said to be associated, but this has never been conclusively proved. Typhoid fever may be obtained from a water-closet, but only if there is carelessness in disposing of the excreta of an infected person through the closet.

From food contaminated as a result of being stored in a place to which germ-laden dust or flies can obtain access, the troubles most likely to arise are those affecting the organs of digestion. Vomiting and diarrhœa, and even typhoid fever, have been traced to the eating of contaminated food, and that they may occur is sufficient reason for seeing that the larder is properly placed, and that the food is sufficiently protected.

The Detection of Defects.—Very often the detection of defects by any other than a trained person is impossible. It is always possible, however, for the untrained to know what proper appliances look like, and to avoid those which appear to be wrong. A house in which the domestic offices are badly situated, badly constructed, badly lighted, or badly arranged, should never be taken or lived in. If they are badly situated, constructed, or arranged, they are almost certain to be associated with other arrangements, some of which cannot be seen, which are a menace to health. If they are badly lighted, they cannot be kept properly clean, and cleanliness is so important to health that it should be insisted upon.

If any suspicion is aroused with regard to the soundness or safety of sanitary appliances, there should be no rest till it is dissipated. If this cannot be done by careful search and attention to cleanliness, the assistance of the expert should be called in. Complain to the Sanitary Authorities, and claim their assistance. It is what they are there for. Their assistance will be readily given, and their advice is generally good, provided—though this is not always the case—it is taken.

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THE BABY

INTRODUCTION

That a child's first years, and especially the first year, are most important needs no proof. While a baby's lungs, in spite of the fact that they are called upon literally at a moment's notice to perform a new and vital function, generally give little trouble, the processes of digestion and consequent nutrition do not seem to become thoroughly accustomed to their life-work until the second birthday is within sight. Even when the baby has grown into the habit of taking its milk without rejecting part of it, there still looms ahead that troublesome period when it must be taught to take solid food. But by the time this stage is reached, the child has taken a firm grip of life; and while its further development needs care, there is little cause of anxiety.

It is before the baby has reached this stage that it has to encounter the greatest difficulties. The danger of death decreases with every month of a baby's life during the first year. During this period the number of deaths is so high as to be nearly half of the total number of deaths from all causes. Happily, this mortality is now fast decreasing.

The aim of this short article is to show that the care of a baby and of very young children does not necessitate anything more than the observance of simple precautions. The writer is a University woman who has had three children with very short intervals between them. The eldest is now 4 years and 3 months old, the next 2 years and 10 months, and the youngest 13 months.[1] Neither father nor mother is exceptionally strong; yet the children have never once been confined to the house, much less their beds. Judging by weight and mental development, all are slightly above the average. The youngest, now 26 lb. in weight, is just beginning to walk, and has a small repertoire of accomplishments.

It has already been pointed out that the children could not have inherited an exceptional physique, and neither have they been brought up in luxury. But certain simple precautions (which will be described in the following pages) have been taken. Two or three useful books were obtained, and their suggestions were adopted or rejected after the parents had discussed them.

One other point may be noted. Hard manual labour the mother has never done; but during the last four and a half years she has written an historical biography, edited one of the classics of literature with an historical introduction, and reviewed about a hundred (mostly) scholarly historical works for one of the critical reviews. This means that almost the whole time has been occupied with hard brainwork in addition to housekeeping, which a servant and a nurse do not obviate. Manual work, provided it is not too hard, is probably much better for both mother and child than brainwork. It follows that what this mother has done there are very few who could not do also; and it is to show the steps by which children may pass through their most critical years well and healthily that this article has been undertaken.

[1] A careful reader will discover, by a comparison between this age and that cited on p. 103, that the writing of this article has occupied several months.

A BABY'S FIRST DAYS

Food.—If it is at all possible, every mother should suckle her child; and this course will dispose of a host of dangers and difficulties. Even the greatest care can hardly compensate for the lack of natural feeding; and the cases where it has not been followed have produced such an impression on me, that I would sacrifice anything before or after birth to be able to feed my child. The child should always be put to the breast a few hours after labour, though if, as is generally the case, there is no milk or a small quantity, little anxiety need be felt for the first few days. If a mother can feed her child, the only precaution she must take is to be careful always to cleanse the nipple before the child is put to feed. A tiny piece of old linen dipped in warm sterilised water (*i.e.* water which has been boiled for from 15 to 20 minutes) is all that is necessary for this, though occasionally it may be well to dissolve a few crystals of boracic acid in the water. The child's mouth should be cleansed in the same way before feeding, though not with the same piece of linen. Cotton-wool is a good substitute for linen and can be readily obtained. The linen should not be used twice.

A mother should first see that she has milk before putting the child to the breast. This can readily be done by gently squeezing the breast, when the milk will be pressed out. If the nipples have been prepared for some weeks before birth by bathing them in water to which a few drops of eau-de-Cologne or whisky have been added, there will be little danger of sore breasts.

If the mother on the third day has no milk or a very small supply, one or more bottles must be given. From the third day for the rest of the month the child should be fed every two hours during the day, and should have a meal if it wakes in the middle of the night. The best bottle, to my mind, is the Allenbury feeder, which is marked in ounces and has a teat at one end and a rubber valve at the other. The teat should be turned inside out, and both teat and valve should be thoroughly cleansed after use. The bottle should be rinsed in cold water, and then bottle, teat, and valve should be placed in a basin of sterilised water and covered to keep out the air and dust. Or, better still, the bottle may be scalded immediately before use. Most bottles will stand boiling, but they invariably crack if allowed to remain in boiling water too long, or if put suddenly into boiling water. I have found it a good plan to immerse the bottle in water which has "just gone off" the boil, before putting the food into it, scalding the teat and valve at the same time.

As I have fed all my babies, the last only for five months, I have no practical experience of the milk mixture for the first months. But the following is a suitable recipe, being in the later months what I have used, and in the earlier modified from the later.[1] I have substituted Demerara sugar for milk sugar, as I found this beneficial with my own children. It is more easily obtainable, and has a slightly moving effect on the bowels :—

First two weeks[2]—
Milk, 1 tablespoon.
Water, 3 tablespoons.
Lime-water, 2 teaspoons.
Cream, ½ teaspoon.
Sugar, ½ teaspoon.
One-half of this to a meal.

Second two weeks—
Every two hours—
Milk, 1 tablespoon.
Water, 3 tablespoons.
Lime-water, 2 teaspoons.
Cream, 1 teaspoon.
Sugar, ½ to 1 teaspoon.
This makes 2 oz., and the meal should increase from ½ to 1½ oz.

Fifth and sixth weeks—
Milk, 2 tablespoons.
Water, 3 tablespoons.
Lime-water, 2 teaspoons.
Cream, 1 teaspoon.
Sugar, 1 teaspoon.
This makes 3 oz., and the meal should increase from one-half to the whole of it.

Seventh and eighth weeks—
Milk, 3 tablespoons.
Water, 4 tablespoons.
Lime-water, 2 teaspoons.
Cream, 1 teaspoon.
Sugar, 1 teaspoon.
Makes 4 oz. Increase meal from 3 oz. to whole.

Ninth week to twenty-first week—
Milk,[3] 4 tablespoons.
Oatmeal- or barley-water, 3½ tablespoons.
Lime-water, 2 teaspoons.
Cream, 1 teaspoon.
Sugar, 1 teaspoon.
Makes 4 oz. Meal 4 to 6 oz.

Twenty-second week to twenty-eighth week—
Milk, 8 tablespoons.
Oatmeal- or barley-water, 4 tablespoons.
Lime-water, 1 tablespoon.
Cream, 1 teaspoon.
Sugar, 1½ teaspoons.
Makes nearly 7 oz. Meal, 6 to 7 oz.

Last four months of year—
Milk, twelve tablespoons.
Oatmeal- or barley-water, 3 tablespoons.
Lime-water, 1 tablespoon.
Cream, 1 teaspoon.
Sugar, 2 teaspoons.
Makes 8 oz. Meal, 7 to 8 oz.

The ingredients should be mixed, the sugar dissolved into the milk and lime-water, and then the whole should be boiled for about 20 minutes. Sufficient can be made for three bottles at once. The mixture should be boiled in a double pan, when no attention is required and there is no danger of burning. The inside pan should be kept scrupulously clean and used for no other purpose. When the mixture has been boiled sufficiently long, throw the boiling water in the lower pan out and fill it with cold water. In a few minutes change this water for fresh cold water. By cooling rapidly in this way no skin forms and the cream of the milk is not lost. Where it is available, cooling on ice is the ideal method. A small jug can readily be found which will just hold the amount of one bottle. This should be well scalded with sterilised water before using (the water from the bottom of the pan will do), and then the milk from the pan can be poured into the jug and thence into the bottle. If sufficient milk has been boiled for several bottles, the rest should now be poured into a basin, which has been washed out thoroughly with sterilised water, and kept covered in a cool place.

To obviate the trouble of measuring so many tablespoonfuls, these may be measured once (for say three bottles, or whatever number is being prepared) and a tumbler, cup, or jug which they just fill, or fill so many times, can be found. It will be only necessary for the future to fill the jug or cup.

The prepared milk only requires warming for the next bottle; but the jug from which it is poured into the bottle must be washed with sterilised water each time. It is best to stand the jug in boiling or very hot water for some minutes, not, as is frequently done, "heating up" in a small pan and pouring again into the jug. The milk should be of sufficient heat to feel warm (not hot) when the bottle is held against the cheek. Or it may be tasted by pouring a little into a spoon. A *cold* bottle may produce very serious effects on the digestive organs of a young baby. The mother should not suck the teat or dip her finger or any spoon (unless scalded with boiling water) into the milk. All these are really the provisions of common sense. It would be folly if, after carefully sterilising the milk (*i.e.* killing all the bacteria in it), the teat, and the valve, the mother should then place her finger or a spoon, each teeming with bacterial life, into the milk, or cover the teat with bacteria from her own mouth.

An excellent sterilisation apparatus is made by Mr. T. Hawksley of 357 Oxford Street, which may be had in two sizes.

Fig. 1 shows a very convenient size, in which the bottle may be either of 1-pint size (with thermometer, syphon, and extra bottle), at 10*s.* 6*d.* (1*s.* extra, post free); or 1½-pint size—the more convenient, at 12*s.* 6*d.* (1*s.* extra, post free). If only three meals are to be prepared at once, this should be all that is necessary for the whole of the first year. It can be used on a gas-stove or fire,

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[1] I find on consulting other recipes that this is a mean between those weakest and those strongest in milk.

[2] The feeding intervals during the second and third months should be gradually increased to three hours.

[3] See p. 101.

and the temperature should be maintained at 155° F. for 20 minutes. Such an apparatus minimises much of the labour of sterilisation. The apparatus shown in Fig. 2 can be had with two

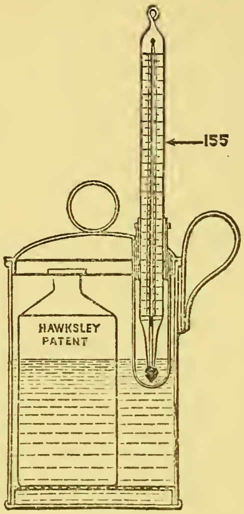

FIG. 1.

bottles for use with a fire, gas-stove, or spirit lamps. This size, with thermometer, syphon, spirit lamps, and one extra bottle, can be had for 25*s.* (1*s.* extra, post free). Sixty ounces of milk pre-

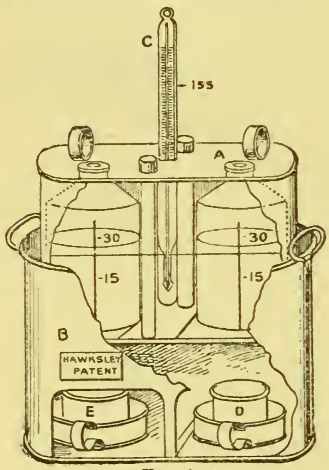

FIG. 2.

paration can be prepared at once, and the apparatus will thus prepare a whole day's food, where it is necessary to do this, at once, even to the end of the year. It is also useful, indeed almost necessary, where there are twins or two young babies to cater for.

A Baby's Day.—A baby commences its day between 6.30 and 7 A.M. About that time it generally becomes hungry, and manifests this in characteristically baby fashion by bellowing. The child's mouth should be cleansed and the mother's nipples, and then it should be fed. Generally one breast will suffice, and the mother should remember at which breast it fed last, and give them alternately. The mother, if in bed, should lay the child on its side in her arm, and, half-lying on her own side, should offer the breast. Some judgment must be used as to how long the baby should feed. If it has been steadily feeding at the breast for about 10 minutes, it has presumably had sufficient, even if it should cry when removed. A mother can easily tell if her milk is coming readily, and this will help her to judge when enough has been obtained. Excess, however, is better than too little, as the baby will only reject what it does not require immediately afterwards.

The child should be sat up after a meal, care being taken to support the back firmly with one hand held flat against it. If this is attended to for a few moments after each meal, there will be less trouble with flatulence afterwards. When the mother has thus given the baby the opportunity to get rid of "wind," she should lay it flat in its cot, when it will probably go off to sleep again.

The mother can now get her breakfast and prepare for the baby's bath. This should take place in a warm room—though no one consults a baby's health who attempts to shut out air from it at any time. A chair should be used sufficiently low to allow the mother to sit in it comfortably with her feet firmly and easily resting on the ground. On a chair near by, the bath—a galvanised iron, porcelain, enamel, or earthenware vessel of sufficient size to allow the baby to lie at full length—should be placed, and the water should be comfortably warm to the hand. Within reach should be the baby's basket, with a needle ready threaded, safety pins, soft brush, vaseline or lanoline, a soap-dish containing some plain soap like Gibb's White Windsor; and the baby's sponge, powder-box containing starch powder, and puff, and a cup containing sterilised water in which a few crystals of boracic acid have been dissolved, and a small piece of old linen should be at hand. On a stool or chair within reach also should be placed the baby's day clothes; a piece of flannel about 6 or 8 inches wide and 1 yard in length to be used as a binder, a small wool vest with long arms, a long sleeveless flannel made to wrap well over the chest and sufficiently long to fold up over the feet,[1] the child's overall, a simple long linen frock with a check string at the neck, woollen shoes (if thought necessary; I have never used them), and one or two napkins, preferably of bath towelling. A soft face-towel and a large bath-towel should be thrown over the arm of the chair.

When all is ready, about 1½ to 2 hours from the last meal, *i.e.* about 9 A.M., the baby may be taken up. Even a baby of a few days feels pleasure in finding itself free of clothes and in front of the fire, "kicking"; it may be allowed to luxuriate for a few moments on the nurse's lap. When the business of the bath begins, it should be performed quickly, so as to decrease the fatigue for the child. Lying on the thicker towel on the outspread lap of the nurse, it should first have its face washed and dried, and then be washed with a soaped sponge from head to foot, each limb and "crease" being washed in a regular order. Then it should

[1] Weldon's Ltd., 30 and 31 Southampton Street, Strand, publish suitable patterns at 7*d.*, post free. No. 32,940 is a good long-clothes set.

be lifted gently and not too suddenly into the bath, its head and back supported by the left hand and arm, while the nurse "rinses" it thoroughly with a dripping sponge. It is better not to use soap for the face; normally, water will be found sufficient throughout childhood. Where the skin seems to require something more, oatmeal is at once soothing and cleansing. In bathing a new-born infant, great care and gentleness must be used with regard to the navel cord. The nurse "dresses" this with a piece of linen, or, better still, a piece of boracic lint, when the infant is first bathed, and each day, for the few days it continues to adhere, a new dressing is applied, being kept in place by the "binder." Water should not be allowed to touch it, and therefore, until the cord detaches itself, the baby should be merely "sponged," and not put into the bath. In a period of from five to eleven days it will detach itself naturally, and no effort should be made to assist it, however ready it may seem to come away. It should leave a dry surface. Should there be any "oozing" the doctor should be consulted.

When the baby is removed from the bath, he should be laid again on the nurse's lap and quickly dried. The soft "face" towel will best serve the purpose, the "bath" towel acting more as a wrap. The limbs and creases of the flesh must be thoroughly dried without much friction, as the infant's skin is very tender. Great care should be taken to rinse and dry the head thoroughly, as otherwise "dry skin" will very soon appear to disfigure the child. Many young mothers are timorous in handling their babies, but a baby's head will stand a good firm "rub." It will be possible to dry the child while still lying on its back, and it should then immediately be "powdered," *i.e.* lightly dusted over with starch powder. Very little is required, and some doctors are against any powdering; but it is easier to keep an infant perfectly free from "soreness" if the groins at least are thus dusted over. It will not be found necessary to use the powder every time the napkin is changed. Thorough drying of the legs and groins at such times is, however, important. When powdered, the baby should be turned over on the nurse's lap—a position almost invariably pleasing to it. The towel being removed, it is now resting on the flannel apron which she should wear and under which she may, with advantage, have another of fine "mackintosh." The flannel binder is easily adjusted in this position, passing almost twice round the baby's body from the front and left loose enough to allow the hand to pass between it and the body. A few slip stitches up the back is a good way of fastening it, and obviates the need of one or more probably uncomfortable safety pins. A Jaegar woollen belt requiring no fastening may be used instead. The little woollen vest should be put on next. A good form is one opening down the front and with long sleeves. The arms should always be inserted into these in a "forward" position, the vest being stretched to reach the second hand, which should not be drawn back to meet the sleeve. The napkin may next be laid in position without being tucked up, the aim being to place all the garments in position while the baby is still on its face, and then when it has been turned on its back again, to fasten them rapidly. The long "flannel" can be partly adjusted, the arms being put through the armholes, and then the child may be turned over. There remains the long frock, which can be easily slipped over the head and arms and fastened at the neck without disturbing the child from its recumbent position.

The baby's mouth should now be washed with tepid (boiled) water or occasionally with weak boracic solution, and the child should then have a meal and the mouth be washed again. It will normally sleep until its next meal time, and after the first week or two there is no reason why it should not lie out of doors in its perambulator, unless it is actually raining or there is an east wind. It should, of course, be warmly covered, though the face should be left free so that breathing is easy. A hot-water bottle for its feet is invaluable. If the child is restless, a change of position will often set it at ease. It should always be laid on its side, which is in fact the position an older child in a healthy condition naturally adopts.

During the first few weeks the child should practically sleep from meal to meal. During the third month it will generally begin to remain awake from seven to ten in the morning and from four o'clock until its evening bath. Later the sleeping time will gradually decrease, but a long morning sleep should be the rule even on into the fourth and fifth years. At about nine months the baby will generally begin to resist an afternoon sleep, which it no longer as a rule requires. The young infant will generally awake for its third meal at midday, and should be fed and laid down again, after, of course, some little relaxation, such as kicking before the fire after its meal, which suggests itself naturally to the mother. It will then sleep again until about 2 P.M., and then with another meal until 4 P.M. After the third month, when the meals are given at three-hourly intervals, the child often sleeps right on until 1 o'clock and again until 4 P.M.

Regularity of feeding is of immense importance, but I doubt the advisability of rousing a child from sleep to take a meal. Even at the first, should a child sleep on past its meal hour, some elasticity may be allowed. Two meals may be spaced into the time usually allowed for three. Much more important is the rule not to give a meal *before* the time because the child is fretful or restless. The cause is often indigestion, which the meal only further aggravates. It is a great temptation to a busy mother to quieten her infant thus, but the solace is only for a few moments, and immediate pain, possibly also a more lasting injury to the digestive organs, is the result for the child.

At about 6.30 the evening bath may be given in the same manner as in the morning, though the child should have a complete change of clothing—the night clothes being similar to the day garments for a young baby. Where washing is a consideration, it is a good plan to use the long frock which has been worn in the day for a nightgown, and thus with the use of only seven gowns a week, the baby can have a clean frock each day, which is the minimum necessary if it is to be clean. So long as the under garments are changed for the night, the child will be sufficiently refreshed and comfortable. Some mothers and doctors advise only a "sponging" and change of clothes at night, because of the fatigue to the child, but I doubt whether there is much difference in this matter, and the actual "dip" is always refreshing. When children are older, the evening bath is even more important than the morning, as the normal child accumulates a fair amount of "dirt" at its play. The morning bath may then be reduced to a mere sponging and dip without soap, while a "good scrub" can be given at night.

After its bath and meal the baby should be placed in its cradle or cot in a bedroom with only a night light, and left to sleep until 10 or 10.30, when it should be again "changed" and "fed." After this it will often sleep through the night, though in the first two months it will generally demand a meal in the small hours. This is not very tiresome if the mother is "nursing" the baby, as she can give it its meal while she is lying down and, changing it quickly, put it back in its cot beside her. It is this meal with artificially fed children that has sometimes been given cold with very serious results. With a methylated spirit lamp the food is easily heated, or a thermos flask may be used with advantage. Long after this meal has ceased to be necessary, some babies will wake in the middle of the night, and the mother or nurse will naturally change the napkin and lay the child again comfortably in its cot. There is often a temptation to allow the infant to nestle on the mother's arm and stay in her bed, but it is a false policy. Apart from the danger of overlying and the certainty of the baby inhaling the mother's breath, the habit is not easily broken, and a vigorous child of a year or eighteen months is not the most comfortable of bedfellows.

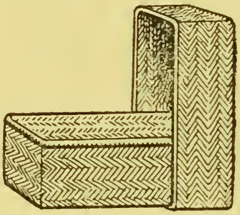

FIG. 3.—Basket as Cradle.

It is necessary to say a word about the baby's bassinet or cot. While most mothers, from sentimental reasons, prefer trimmed cots, it may be said at the outset that the elaborately trimmed cot is merely a dust trap; and in many ways a simple bassinet without trimming is much healthier. A simple screen drawn round it will keep off any harmful draughts and excess of light, and the baby has a much better current of air. If, however, a mother prefers a trimmed bassinet, it is much wiser to arrange the trimming so that it can readily be taken off and washed.

For a simple bassinet perhaps there is nothing better than one of the Japanese travelling baskets. The two pieces should be comfortably lined with quilted sateen or some good washing material, and while one serves as the bed, the other can be placed over the end to act as a shade and a screen. This improvised bassinet has also the advantage of being very light and easily moved about; and again, if travelling has to be done, it will form a receptacle for the baby's wardrobe.

There are also the basket and metal cots. These are generally trimmed with pink or blue sateen covered with white muslin and lace or with a simple covering of some pretty, light-coloured, washing material. The cot must also be raised above the ground on a steady stand. It is best to have it the height of the mother's bed.

A well-made wicker bassinet costs from 3*s.* 6*d.* and upwards, and a stand 5*s.* or 6*s.* extra, while the metal cots swung on a stand can be had for 10*s.* and upwards.

When the child is about six months old it may be advisable to remove it to a larger cot. These may be had fairly cheaply to take to pieces. The wooden ones I have used have a spring or wire foundation, with high sides, which can be swung over. This facilitates attending to the child. These cots are also very light, pack up easily, and can be used until the child is four or five years of age.

EARLY DEVELOPMENT

A healthy infant grows rapidly in weight and activity, and the weekly weighing of a young child is almost the best test of its progress. Every baby should have its "weight chart" (p. 264), and mother and nurse should take infinite pains to discover the cause of the child's failing to increase in weight in any week or still more of its "losing." The average weight of a boy baby at birth is about 7¼ lb.; of a girl, a little under 7 lb.; but some babies weigh as much as 10 lb. or more at birth and many less than 7 lb. During the first few days there is generally a slight loss of weight, as the child takes little nourishment, and also because of the expulsion of "meconium" from the bowels. After this the gain should be steady. During the first and second months the child should gain in each week from 5 to 6 oz., in the third and fourth months 4 to 5 oz. each week, and the fifth and sixth months from 3 to 4 oz. weekly. The weekly increase after this will be slightly smaller. The average weight of a boy 1 year old is 21 lb., of a girl a little under 20 lb. Much depends, of course, on the initial weight. There may be occasional fallings off due to such trivial operations as circumcision or vaccination.

It is advisable for all boys to be circumcised, for reasons of health and cleanliness, and the earlier this is done the better, provided the child is strong enough to bear an anæsthetic or the slight shock of the operation. Many doctors apply a "dressing" after circumcision, but a small hollow sponge soaked in boracic solution and kept in place merely by the napkin is really the most soothing method of treatment. A baby need really feel no discomfort at all from the operation. Similarly, a vaccinated arm requires no dressing, but should merely be protected by a piece of boracic lint wrapped loosely round it. The earlier vaccination is performed also the better, as the young infant moves its limbs less and feels little if any pain. The arm should be freely rinsed with water during the bath, but soap should not be applied. Many babies are now vaccinated during their first month.

As a baby increases in weight it grows more vigorous. In the third month it will kick with zest and coo and smile in answer to a caress. Some children seem to give an answering smile even from the first, but it is an unmistakable sign of recognition by the third month. The baby can now be laid on a bed and allowed to exercise its limbs freely; but soon, when it begins to "roll," it is safer to lay it on a rug on the floor, well screened from draughts. Where this is difficult it is better to sacrifice some exercise for safety. The child generally enjoys lying on an out-spread lap. It should never, of course, be "sat-up" to support, even partially, its own weight. In the third or fourth months it will be able to hold its head up, if its back is well supported, but an infant should spend the greater part of its first year on its back. When out of doors it should not be propped up in its perambulator until it is quite strong in the back (about the sixth month), and then only for a short time. The four-wheeled perambulator, allowing the baby to lie full length, is the only good form in the first year. If a child is accustomed to lie, it will not as a rule resist in this matter. Children will often accept the lying position as the natural one for their "airing" until the ninth or tenth month. It is generally at this time that a baby can really sit up without assistance, and it can then be bathed in a bathroom and handled more or less like an older child.

Before this, often in the seventh month, it begins to "creep." Sometimes it begins by a curious snake-like dragging motion forward across the floor, moving almost imperceptibly, but it soon rises on "all-fours" and can get about at an enormous rate; and now generally begin the nurse's troubles. Every dangerous article should be removed from the nursery, and if there are older children they should be taught not to throw beads, or such articles as the infant might swallow, on to the floor. Children can be made wonderfully careful when they know there is real danger. The coal-box will generally find its way out of the nursery or be placed inside the "guard," a necessary piece of furniture for any room in which children habitually move about or play. It must be remembered that with all young children absolute and constant vigilance is necessary to preserve them from accident. Windows of the "French" sort should be barred. The ordinary windows opening upwards and downwards should never be left open more than an inch or two at the bottom,[1] for fear of the older children leaning out when the nurse's back is turned. It should be strictly forbidden to climb on chairs to obtain anything from the mantelpiece. Medicines and lotions should never be left within children's reach. Even the most model children have occasional "freakish" fits, when they will dare anything. It is useless to try to prevent a child of three or four years from climbing, but the nurse should be watchful, and children as a rule take notice of a word of caution.

Soon after the crawling stage is reached, the baby will begin to stand, holding on to some article of furniture. It is well at this time to stretch a net or webbing (my nurse made a quite suitable net by knotting ordinary stout string, and no doubt this would be quite easy to a handy man) over its cot for fear it should, when no one is in the room, lean over the side when it wakes, and fall—an accident which may prove fatal. Similarly, the child should not be left to sleep out-of-doors without some strap or contrivance which will prevent its leaning out of the perambulator when it wakes. A good plan is to place the perambulator in such a position that the mother or nurse can "keep an eye" on it while she writes or works.

At about a year the child can generally walk round the room holding on to the furniture. Some children can actually walk alone at eleven months old, but this is rare. Fifteen months is the average age for independent walking, and there is no cause for anxiety if an apparently healthy child does not walk at eighteen months, though it is strong presumptive evidence of backwardness in mental or physical development, and if the child does not walk soon after eighteen months it is safer to consult a doctor. A child will walk when it is "ready," but should not be encouraged to do so prematurely, much less forced to take walks out of doors as soon as it can "toddle." The joints are loose even in the third year, and a child of 2 or 3 years of age is not fit for long walks. A small "mail" or "push" cart can with advantage replace the perambulator at this stage. In holding a child's hand care should be taken that its arm is not unduly stretched, and it should never be lifted off its feet by an older person holding its hands. A child's upper limbs are easily dislocated. A child of 2 can generally walk up and down stairs alone, but someone should be near it, and a child of nearly 3 should be taught to hold the balustrade and step carefully.

A great event in the first year is the appearance of teeth. They generally appear in pairs, and the first pair, the lower incisors, are sometimes "cut" as early as the fourth or fifth month, but more generally when the child is seven or eight months old. After this the teeth appear at more or less regular intervals until the first set of twenty, the "milk" teeth, is complete at about 2½ years of age. "Teething" need not be a very troublesome process. Often the first teeth come quite unnoticed, and some children give no trouble whatever in the matter. As a rule, however, the child will be a little restless or "below par" for a day or two before a new tooth appears. The gums may be red, swollen, and painful, but the more acute discomfort is generally from indigestion or some irregularity in the action of the bowels, which marks the slightly abnormal condition of the child at the time. The "tooth" rashes which sometimes appear are generally due to digestive disturbance and not to any occult action of teething. There is a danger of some real defect of diet or treatment being overlooked through the attribution of its consequences to "teething." The infant will often lose its appetite at "teething" times, and it is foolish to try to force it to finish a bottle when it has manifestly had enough. A child's instinct is often very sure in these matters. Special attention should be paid at these times to the action of the bowels, though dosing with "teething powders" is often injurious, especially if, as is often the case, they contain opium.

The order in which the teeth appear is generally as follows:—

(1) The two lower central incisors in the seventh or eighth month.

[1] Unless barred. Almost any man who is handy can make stout wooden bars and screw them on to the sides of the windows.

(2 The four upper incisors between the eighth and tenth months.

(3) The lower lateral incisors and the upper and lower front molars between the twelfth and fourteenth months.

(4) The eye teeth between the eighteenth and twentieth months.

(5) The back molars between the age of 2 and 2½ years.

From the first the greatest care must be taken of the mouth and teeth. The "washing" of the mouth should be continued, at least,in the morning and evening, until the child is old enough to use a tooth-brush. The washing before and after each meal is not necessary after the first few months, when the flow of saliva has increased and the milk particles no longer remain on the gums and inside the cheeks. A child of 2 can very well have its teeth brushed, though it takes some time to learn to "rinse" its mouth and not swallow the water. As soon as it has acquired this art it is best to supplement the tepid (boiled) water by some simple and safe chalk powder, as the teeth even of small children tend to become coated and yellow otherwise. The condition of this first set of teeth should be as carefully watched as the permanent set which normally replaces them at about the age of seven years. This is important both immediately for the digestion and because the condition of the first set of teeth seems to affect that of the second. When possible, regular visits should be made to the dentist for inspection and, if necessary, treatment. Every child should, of course, be taught to make good use of its teeth in the mastication of food.

It has frequently been said that the use of a "comforter" tends to disfigure the teeth, but there is no proof of this or of the many other evils often attributed to this habit. Where a mother finds it possible, it is perhaps advisable to dispense with this rather troublesome and not ornamental aid. Where it is used the greatest care should be taken to keep it thoroughly clean. It should be scalded or boiled at least once a day, and never given to the child before being washed after it has fallen to the ground. It is in the hands of a careless mother or nurse that the thing may become really harmful.

When the child has reached the age of three months it is customary to discard the long clothes and use ordinary short baby clothes descending to a little below the knee. The time, however, is elastic, though it is harmful to postpone the "shortening" too late, as the baby's limbs are hampered. But it is a wise precaution not to be too anxious to discard the long clothes if the weather is very cold, and the woollen or flannel binder should be worn until the end of the second year unless the woolly vest is long enough to come well down over the abdomen.

When the child begins to crawl, sometimes "crawlers," long divided overalls, are used. They serve to keep the child clean and warm; but, naturally, grow very dirty themselves. If the nursery is kept thoroughly clean, a point upon which a mother should insist, it is just as clean and more convenient for a baby to crawl about in its ordinary short clothes.

Where it is possible, a room with a southern aspect should be set apart for the nursery. It should be of a good size with large windows (barred, of course), with a fireplace shut in by a strong guard, which it should be impossible for a child to move. One that covers the grate right over is the best. It is a convenience, too, to have a rail on the outside on which the baby's towels and small articles of clothing can be hung to warm or dry.

The walls should be washable throughout—distemper, enamel paint, or varnished paper are all

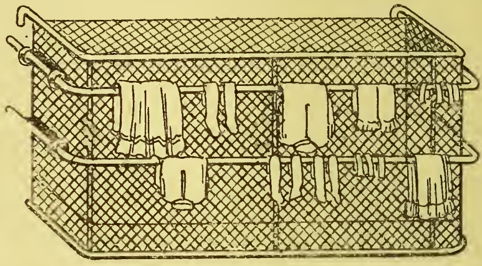

Fig. 4.—Nursery Fire-guard.

suitable coverings. A light simple colour or design is best. If variety is desired, a simple coloured frieze with a few figures of animals, birds, or flowers, &c., may be added. There might also be a few good pictures on the walls, of objects that will interest children. Pictures must not be hung too high, but must not be within reach of a baby.

The best floor covering is cork carpet, as it is warm and washable and very durable. Uncovered floors are not good, unless of a real parquet covering, as splinters are apt to come off the wood, and carpets are not hygienic.

As for furniture, the less there is the better, and what there is should be of the simplest description. It must be of a kind that is easily washed and cleaned, with as few sharp angles as possible, and arranged so as to leave open floor space for the children to have a full clear run in which to exercise their limbs. A good steady table for meals, a few

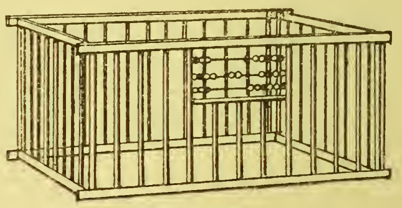

Fig. 5.—Play-pen.

chairs, a low chair for the nurse, a roomy cupboard, a toy-cupboard, a low kindergarten table with a little chair for each child, are the principal articles required.

The cupboard may be placed over the mantelpiece on iron brackets, and divided into compartments. If meals are taken in the nursery, this will hold the children's special china, table linen and so forth, and sewing materials. It may also be used to hold simple remedies, the weighing machine for the baby, clinical thermometer, more expensive toys and books, &c. Painted in white enamel such a cupboard is not at all unsightly, and the weighing chart can be fixed to the outside of one of the wooden doors and thus kept ever in mind.

Another cupboard within a child's reach, should be set apart for toys in everyday use. The children shoud be accustomed to putting aside their toys after play, a very useful disciplinary measure.

One of the most useful of all articles of furniture in a nursery is a playing-pen in which a small child can be put to crawl about and play without any danger of its hurting itself. Such a pen may readily be made by a handy man. A washable crawling rug will be useful. A screen with washable curtains, such as is seen in any hospital, should be at hand for the baths, or for drying after bath.

DIET AND DIGESTION

The whole health and much of the happiness of a normally strong child depends on the state of its digestion, and this, again, largely on the character of its diet.

For the first year of life liquid food, *i.e.* milk at first diluted and finally undiluted, is sufficient, and solid food cannot but be injurious. It has been already pointed out, and it cannot be too much emphasized, that no food can suit a baby so well as its mother's milk. The mother who is feeding her child should do all in her power to keep herself in good condition, and so produce a sufficiently good quality of milk to satisfy her infant. She should take regular outdoor exercise and avoid any very acid food at first, or any rich or indigestible articles, as these affect her own state of health and to some extent the composition of the milk. When a mother has not sufficient milk to satisfy the child entirely, she should not immediately wean it, but, while still making every effort to improve the flow of milk and its quality, it will be advisable for her to give one or two bottles a day of artificial food of the quantity and strength prescribed for an artificially fed baby of the same age. In any case many mothers find it necessary to give one bottle a day after the child has reached the sixth month, and it should be put altogether on to artificial food by the end of the ninth month, after which the mother's "nursing" is not good for either herself or the child. Weaning should be a gradual process, the number of "bottles" given daily being increased at intervals of at least a week. The child is thus more gradually accustomed to the new diet, and the mother's milk gradually decreases with the diminishing demand. Otherwise the breasts may become very swollen and painful for a short time.

For artificially fed babies the best substitute for the mother's milk is cow's milk (see page 95). Barley-water or oatmeal-water may be substituted for water after the first few months. Both are slightly nourishing and have a beneficial effect on the bowels. They are easily prepared from Robinson's Patent Barley or groats. Care should be taken not to make them too thick; a very "flat" dessertspoonful to a large breakfastcupful of water makes the right consistency.

The food should be prepared as soon as possible after the arrival of fresh milk, lest this should become sour or even lose its first freshness. Long before milk is really "sour," it may be in a condition unfit for an infant's food. This deterioration should be prevented by early boiling or sterilising and rapid cooling, as described on p. 95. Where milk comes in fresh twice a day, only the bottles which will be required before the next arrival of fresh milk should be prepared. (I have generally boiled three "bottles" at a time.) After sterilisation the milk should be covered to keep out dust and prevent as far as possible any contamination.

Sometimes some form of prepared food is found to agree better with a very young or delicate infant, or may be used temporarily for a healthy infant. When there is difficulty in obtaining a supply of reliable cow's milk, condensed milk (diluted) may be used. When this is given, a new tin should be opened each day. The dilution of the milk will vary according to the age of the infant from one part milk to sixteen of water to one part milk to eight of water. For babies up to the age of two or three months Allenbury's No. 1 Food (which is a modified milk powder), is the best. From about three months to six or eight months Allenbury's No. 2 Food (which is composed of the No. 1 Food with the addition of a malted meal) or Horlick's Malted Milk (composed of dried milk, malted flour, and a small proportion of bicarbonate of soda) should be substituted. Foods intended as an addition to cow's milk are suitable only for babies above the age of eight or nine months, for whom they are quite a valuable addition to the dietary. An artificial food should not be used exclusively unless absolutely necessary, as, if continued over a long period, scurvy is almost sure to ensue. Even when given temporarily, it is as well to give the child (not, however, under three months) one or two teaspoonfuls of fruit juice, if it is found able to take it. It must be noted that no food is ever so valuable as cow's milk carefully modified in accordance with the directions already given, and, being fresh, it contains elements which prevent scurvy.

Sometimes a child of eleven months will seem to require something more than its "bottles." In such a case, rather than give solid food, I should recommend my own practice of mixing the yolk of a new-laid egg with one of its bottles daily. When the child is a year old, the midday bottle may be replaced by a light meal, such as soup made from fresh meat and vegetables, followed by the pulp of a well-baked and sweetened apple. Thus the first step towards putting away the feeding bottle is made. If the child takes well to its new diet, the ten-o'clock bottle at night may be given up. In fact, many people discontinue this at nine months. The child may now be given a breakfastcupful of thin gruel after its evening bath. This it will take from a spoon. I have found that at fifteen months a baby will drink its milk too from a cup. Children are more or less conservative in this matter, and indeed differ greatly in power of swallowing. Small, very small quantities of thin bread and butter may be given after a "bottle" at this stage, or even a biscuit, which the year-old baby seems to find much pleasure in crunching, but it must not be allowed to cram its mouth, as it will probably "choke" over the unaccustomed fare.

An alternative dinner to soup is a little thin milk pudding and apple, or a lightly boiled egg, though this should not be given if the yolk of an egg is still given in milk. Generally a child will only eat part of an egg until it is about two years old. At first the baby will probably resist the new food—at any rate, the soup—but a few days' perseverance will suffice to overcome its objections, and until the third year, when a little meat or fish can be given, soup really makes the best dinner. The meat from which the soup is made, and also the vegetables, should be fresh and varied. A mixture of shin of beef and knuckle of veal with vegetables makes almost an ideal soup for children. Some bread may be crumbled into the soup plate or a little finely-shred or mashed potato, but care should always be taken not to overload the child's stomach with too much solid matter. At eighteen months a little vegetable such as the flower of cauliflower may be given, or very tender French beans.

When the molar teeth are cut, small quantities of boiled fowl can be given, and soon a little finely-shredded meat from the underdone portion of a hot joint. Up to the age of three years the greatest care should be taken to give the child only the most digestible food, and indeed all through childhood the ideal should be much the same. Much milk should be drunk, but it should not be forced too rigidly on children. If they are allowed a little latitude in the matter, they will generally like it as a drink. I have found that my children of 3 and 4 years of age will still take from a pint to a pint and a half each day. I have always sweetened it and given it tepid as during babyhood.

Porridge *well cooked* is excellent, but that too tends to pall, and it is better to give it only on alternate days when such is the case, or, if there seems to be a genuine dislike for it, it will often prove a good plan to drop it from the menu altogether for a time. Cocoa made with milk is a nourishing drink if it is not found too heavy. Such meats and fish as are most suitable for invalids are also the best for young children. Meat should never be cooked twice, and all forms of meat pies and savoury dishes such as sausages, kidneys, and liver are bad. For breakfast a little fat bacon well cooked makes a change. White fish boiled or stewed in milk is excellent.

Chicken, turkey, pheasant, and partridge are the best fowls, while goose, duck, veal, and pork should be avoided. Well-cooked vegetables are beneficial, but should not be given in too large quantities. Milk puddings are the best, but any simple light pudding may be given as the child grows older. Sweets are often beneficial when not eaten between meals. Bread should be at least a day old, and "standard" bread is more easily digested than wholemeal, but both are good if found to agree. Jams, honey, syrup and marmalade are all wholesome, as also is stewed fruit and the juice of such fruits as oranges and grapes. Raw and unripe fruits should not be given to children. It is quite common to see children eating raw apples and pears, but these are not good. Still less are dried fruits, such as figs and prunes, though these, especially the latter, are excellent when cooked because of their effect on the bowels.

One of the most common troubles of childhood is constipation, *i.e.* the sluggish action of the bowels. The greatest attention must be paid to the regular and sufficient action of the bowels. For the first few days the action of the bowels of a newly-born infant consists in the expulsion of "meconium," the bile which has been stored up in the intestines before birth. It is of a dark brown colour. Gradually the stools become lighter, and a healthy baby for the first few weeks will have at least three or four motions daily, each motion consisting of two or three ounces of deep yellow half-fluid matter. There should be no disagreeable smell, and, if the child is digesting its meals, there will be no curd of milk. Sometimes this is present in the form of white specks. The stools will become greenish if exposed for some time to the air, but should not be so at the time they are passed.

If a child has only one motion a day in the first few weeks, it is suffering from constipation, or even if it has several very scanty or hard motions. In a few weeks the number of motions daily will probably fall to two, and this may continue as far as the third year, when one motion is the rule. A child in its second year also often has but one motion daily. Constipation may be due in infants to some constitutional weakness of the bowels, which seems to be growing increasingly common. More often it is caused by a deficiency of fat in the food, or even a deficiency in the amount of food itself. A breast-fed baby suffers less often than others from this complaint, but the condition is very common even with these. The mother should in these cases make every effort to regulate her diet in a laxative direction, taking abundance of nourishing food, and especially porridge, fruit, and vegetables.

She should try to ascertain the quality of her milk, if these efforts and increase of outdoor exercise do not suffice to remove the annoyance. It may be well for her to give one bottle a day, a change which is sometimes followed by an immediate effect on the bowels. With older babies a scantiness and hardness of the stools indicates the point when a change may be made in the proportion of milk to water in their diet. It may also be beneficial to increase the amount of cream in the bottle, adding, say, another teaspoonful to each. Mellin's Food, as an addition to the bottle, has an excellent effect on the bowels, and the same purpose is served with the older children by the barley- or oatmeal-water with which their milk is diluted. After the first year, when the food is more varied, less difficulty is experienced in this matter. It is the greatest mistake to treat constipation in either infants or children by repeated dosings with aperients. Every effort should be made to overcome the trouble by regulation of diet, and with older children by insisting on sufficient and regular exercise. It is sometimes found beneficial to rub the abdomen of a young infant with the flat of the hand smeared with some aromatic oil. The movement should be gentle and the pressure equal, and should be in a circular direction, beginning low down on the left side and passing round to the right. This may be done for five minutes when the baby is undressed for its bath.

Opinions seem to differ as to the beneficial effects of injections or enemata. Most doctors prefer a glycerine suppository for young infants, and when the bowel is healthy and merely sluggish it responds readily to this. If an enema is given a teaspoonful of glycerine mixed with a tablespoonful of boiling water will answer well. The glycerine cools the water and brings it to about the right temperature for the injection into the bowel. But great care must be taken that the liquid is only warm. If it is cold or too hot, much harm may be done. The injection should be made with a glass syringe with a vulcanite nozzle, as a glass nozzle might break and injure the bowel.

The administration of a few spoonfuls of tepid drinking water daily to a young baby is often good, or fruit juice or a syrup of sugar and water given after a meal. But all babies do not seem to be able to take these, and it is best to desist if it is found that the child is inclined to vomit as a consequence. Regular "training" is valuable in helping towards the regular action of the bowels. Cases of obstinate or chronic constipation should be treated by a doctor.

As children grow up, their diet approximates more and more to that of the ordinary adult; but poor mothers may comfortably reflect and mothers in better circumstances be warned, that when all is said the best food for children is ever the simplest. Porridge and milk is always one of the best foods. I find that it is hardly advisable to substitute cream for milk, at any rate not till the children are past their third or fourth year. This is a point that may be recommended to mothers who are anxious to give their children fattening (which they call "nourishing") food.

After constipation I suppose skin troubles loom largest on the horizon of the average mother, and it is very probable that the cause of both is, to a great extent, indigestion.

Few things are more distressing to the young mother than to see her baby disfigured by rashes and "spots," but these are very common in infants, and are, for the most part, connected with difficulties of digestion.

Such rashes and spots do not readily lend themselves to direct treatment. If they should even *threaten* to become serious, a doctor should be consulted, as the child may be developing some form of eczema. (See p. 106.)

Some children tend to have a certain "roughness" on the cheeks in their second or third years. This probably arises from some slight difficulty in digestion. The greatest attention must be paid to diet. The only external treatment advisable is the application of some emollient such as Hazeline Cream before the child goes to bed each night. It is best to leave the face free of even this in the daytime.

CLOTHING AND EXERCISE

A normal mother who sees much of her children will hardly require to be told that children as a rule exercise themselves very thoroughly by instinct. They stretch and strain, lift, carry, push, pull, run, walk, creep, bend in every direction, kick, talk, shout, sing, and scream. If any means of exercising any part of the physique of a child is not covered in this meagre list of a child's daily doings, I feel confident it is included under some omission from the list. It is for this reason that I think physical exercises for ordinary healthy children quite superfluous. My own experience of a system I tried is that the children take up the positions only very approximately, and carry out the exercises even more so. The result is, that exercises planned to develop certain parts of the physique do not affect them except in the remotest manner, and, in a word, the occupations upon which the normal child is so busily engaged throughout the day perform all the required development. The reason of this is very clear. It is almost impossible to make a child up to (and probably some distance beyond) the age of 5, carry out actions that must appear aimless to it with any zest, even if such actions are accurately performed. There can be little if any use in waving arms about limply, and this is all that can be achieved. But in pushing a large toy perambulator with the latest "Cupid Ascolot," "Lily Maid," &c., packed in, a certain force is called forth. There is no need to labour this point. My youngest child, who is but 18 months, has for some months been in the habit of lifting himself until he hangs suspended from one of the brass bars across the nursery window. The operations he goes through are a perfect exercise for most of the muscles of his small body; but how to accomplish the same exercise by artificial exercises I do not know. A good nurse or mother will always be able to encourage children who are inclined to laze by some new game or occupation, and this will be quite sufficient for the first five years of life.

There is, however, one exception to this abdication of systematic exercises to instinct, and that is as regards posture generally. A little girl will often put her head down to run. She should be taught to throw her head back and her chest forward. At times they will sleep with their mouths open, or run, breathing through their mouths. This should be corrected at once, the child being taught how to breathe through its nose. When asleep the mouth can be gently closed without waking the child.

Fresh air is most necessary for children, and they should be out nearly all the day when it is fine. If the house has a garden, the children can be turned into it as soon as they are bathed and dressed in the morning. But it will be found necessary to take them out, as they naturally become tired of being in one place too long. A caution may be given here with regard to the amount of exercise children should be allowed to take, though I think a child will almost always say it is tired when it has had sufficient. A child of 3 years or under should never go out any distance unless accompanied by a perambulator or push-cart in which it can be wheeled when it is tired. As an almost universal rule no child will allow itself to be wheeled if it is able to run or walk comfortably.

Another problem connected with the exercise of a child is the morning or midday sleep. This should be continued rigidly until the child is about 4 years of age. After the morning walk the child should be undressed and put to bed about 11.30. The child can be waked about one o'clock for the midday meal. It is generally better to continue the midday rest a year longer; but a child over 4 years of age very often resists, and if put to bed disturbs the sleep of other children by singing or shouting. When a child reaches this point, it is probably much better to allow it to play quietly in the nursery, looking at books or pictures.

After food and exercise, the greatest factor in a child's health is, I suppose, clothing. This is not a great problem. The vast majority of children are much over-clothed. My own children have always caused comment by the little clothing they wear. The clothing for the first year has been described already (p. 96). After the first year my children have worn in summer woollen combinations, with small knickers (closed by buttons on the waistband) of dark blue linen fastened by buttons on to a slip, and light alpaca frocks, with sandals but no socks. In the hot sun they have worn straw hats. An ordinary mushroom shape affords the best protection. In winter they wear over their combinations woollen jerseys and skirts, the upper of the latter being a mere slip on to which the skirt and knickers (which may be of stockingette, or flannel—though I have never found these necessary) may be fastened. They also wear stockings, coming well up the leg, and boots. For the very coldest weather they have serge full-length coats; but they have very rarely worn them except in the cold northern winds. Hats they never have worn in winter. Clothing of this sort is not expensive, and it is certainly healthy. Three layers is the most my children have ever worn except with party frocks (when a light skirt is worn in addition) or in winter when the coat is worn. Light clothing such as this gives the children freedom to develop, and the closed dark knickers have a certain effect on health of mind as well as body where children of opposite sexes play together.

A boy wears over his combinations a linen tunic and linen trousers buttoned on to a slip, with sandals, no socks, and a straw hat for the sun. A serge tunic (or woollen jersey) and trousers, and the addition of stockings and a possible full-length coat make all the necessary change for winter.

In no case should children of either sex wear tight clothing: tight waistbands, &c. My girls have never worn stays of any kind, and will never wear corsets. I have never worn them, and there can be no question that it is healthier to dispense with them altogether.

Children should never be allowed to retain damp clothing. If they are out in the rain, all the clothes that have any trace of dampness should be changed as soon as they reach home. Even if it is not raining but slightly damp under foot the boots or sandals should be taken off—in any case it is a good practice to change boots even when not damp—and put on house shoes. Children should also have bedroom slippers, to be returned there after the morning bath; nightdresses, preferably made of flannel—viyella I have used; and dressing-gowns. Any mother who has any experience of sewing can make a dressing-gown out of some fleecy sort of flannel. Dressing-gowns are necessary, because it is almost impossible to keep children out of draughts before and after bath time. Draughts and cold feet are the two great evils against which every mother must be on her guard. Children when interested will stand at an open door through which a gale is blowing in their night-dresses, unless they are carefully watched. No insistence can be too urgent against the evil of chills. A child must never be allowed to loiter about in its night-dress or barefoot.

On the other hand, the window of the nursery both day and night should always be opened fully, unless the door is also kept open (as in the early part of the night) so that any sound may be heard. At night the window opened top and bottom to its fullest extent should most certainly be adhered to as almost a necessity. In the daytime in the coldest weather, perhaps, it may be sufficient to have the window only half-opened at the top.

Children should be taught to sleep from the very first days on a hard mattress, with a very slight pillow if any. My children have never had them. The bed covering should be slight; two warm blankets I have found sufficient even in the coldest weather.

The unfortunate habit of wetting the bed can be checked to some extent, even if not completely, among very young children, by providing that they are not disturbed at all by any noise, until the nurse or mother takes them up before going to bed herself. If they are disturbed before, the evil cannot be prevented, for it generally takes place immediately on waking. Generally the evil vanishes between 2 and 3 years of age; but the age varies, and may be extended in nervous children. If the child has not been taught to stop the habit by the age of 3½ years, the doctor should be consulted, as it is probably due to some derangement of the nervous system, most often occasioned by difficulty in breathing at night due to adenoids. Punishing a nervous child for a habit over which it has no control will only make it more nervous and do it the greatest harm, while simple treatment by the doctor will relieve the condition.

GROWTH AND HEALTH

With the exception of the first few days of life, when a child may decrease in weight, it should grow steadily heavier, and the best possible check upon disease is consistent weekly weighing, which should be rigidly adhered to. Normally, a child may be expected to gain 5½ oz. weekly during the first two months, about 4½ during the next two, and about 3½ during the fifth and sixth months. If this actually took place, a child weighing 7 lb. at birth would, at the end of twenty-six weeks, weigh 15 lb. 5 oz., a little more than double its weight at birth. Its progress could be represented on a chart such as that given here (Fig. 6), and every mother is strongly recommended to keep such a record[1] of her baby's progress during the first six months of life at least. It will be noticed that in this chart each vertical square represents half a pound, and each horizontal square one week.

Above the line of bold black dots which represent the ideal average baby's progress I have marked all the weights I can find preserved of my own last baby. A comparison of the course of the ideal average baby with that of a real above-the-average

[1] Weight charts can be bought from Messrs. Hawksley, 357 Oxford Street, London, W., price 3*d.*, but anyone can buy a piece of ordinary squared paper and use it as a weight chart, by marking any selected number of squares for one pound and any number for a week.

baby is instructive. It will be noticed that the weight of the real baby, 9½ lb. at birth, fell slightly during the first week. As this was quite explicable by, and, indeed, to be expected from, experience, it caused no anxiety. But the strange waviness of the dotted line joining the points marking the weights shows how easily the normal course of a baby's development may be disturbed. This baby has, so far, been quite healthy. A big child to begin with, he has consistently kept well above the average. There have been no wakeful nights with him. Indeed, my three children have only provided one wakeful night among them.

A small variation from the slightly curved line which should be formed if the dots representing bath. The child was in this way gradually weaned. At six months he was wholly living on artificial food.

Now, this illustrates the use of the weight chart. A child may look well, especially about the face, which is generally the last feature to show a change, even when he is losing weight or at a standstill. The looks of a child are not very trustworthy; but the scales cannot lie, and if a baby is not steadily gaining by amounts approximating to those given on page 104, there is something wrong, and the sooner it is seen to the better. If the gain is steady, but not as great as it should be, this again is a matter requiring investigation.

The weight of a child after the first six months

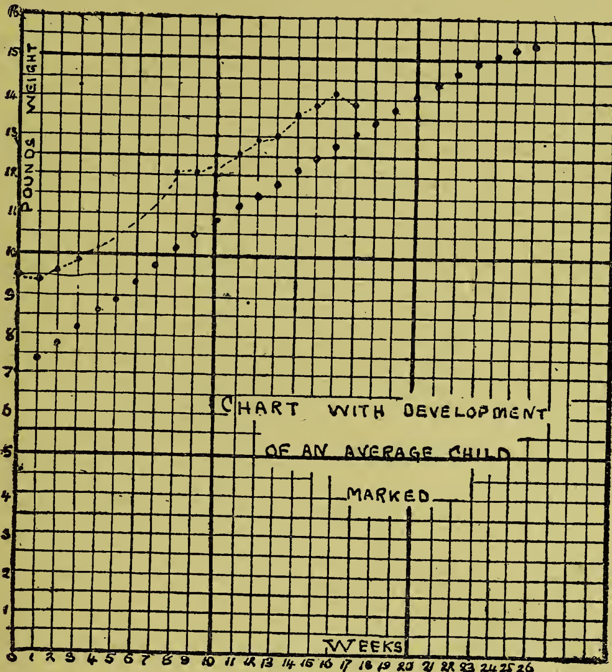

FIG. 6.

the weekly weights of an ordinary healthy baby are joined, is therefore not very significant, though each time the gain in this case was less than it should have been every possible cause was discussed, and the fact that the next week after a *small* gain showed a *greater* increase, is sufficient proof that the cause had been found. At times it was caused by my eating unsuitable food or overtiring myself in some way, at other times through some carelessness of the nurse, such as standing with the baby in a draught when he was undressed for his bath. The seventeenth week shows a distinct fall in weight, the first since the first week. The two preceding weeks had shown only slight gains, and, after thinking of all the circumstances, it seemed clear that the child was not obtaining sufficient food. One bottle was therefore given him per day after his morning bath. When the gains again commenced to be small, another bottle was substituted for breast-feeding after the evening does not increase so rapidly, and the decrease in rate continues to the end of the fifth year, as well as far beyond. Thus, while a normal child will more than double its weight in the first six months, it will only increase to about three times the weight at birth in the first year, and will only double its weight at the end of the first year in the next four years. But the child, if healthy, should always be gaining, and the weight chart should be kept up for the first year.

There are many methods of weighing a child. It can be placed, during the early months of life, in a basket and weighed by a spring balance, the weight of the basket and clothing being deducted. It is best to weigh the child naked. This may readily be done before the evening bath. The child can then be slipped into a basket, and weighed with the spring balance. Of course there are other and better methods. Several special balances are made for weighing children. Mr. T. Hawksley, of 357 Oxford Street, London, W., is the maker of a convenient model, as shown in Fig. 8. The price with chart is £1, 1*s.*, sixpence extra being charged for packing. Even if a mother does not possess any weighing machine, the local chemist will probably weigh the child for a penny. If the same clothes are always used when being weighed at the chemist's, they can be weighed once, and the weight be deducted from the total for the future. In leaving this point, let me again strongly urge all mothers to weigh their babies weekly for the first year if possible, but if not, or if very inconvenient, at least for the first six months. It is an almost infallible guide to the child's health, and one may be absolutely certain that nothing can be amiss with the child while a keen eye is being kept upon the weight chart.

A normal child doubles its height at birth by about the end of the fourth year, and at the same time its chest should be more than half as broad again. In the first year its height increases by about 50 per cent. Thus, if it is 20 inches at birth, a normal height, it should be 30 at the end of the first year. The chest in the same period should have grown a little under 50 per cent. These figures are, however, not so important as the weight, though it is a wise precaution to keep a record of chest measurement. If the development in the chest seems slighter than it would be, it will be well to teach a child old enough to understand to take ten or twelve breaths *through its nose* two or three times a day, each long breath to be followed by a long expiration. When the child is thus filling and emptying its lungs as fully as possible, the windows should be wide open and the air quite pure. It is better if they can be taken outside.

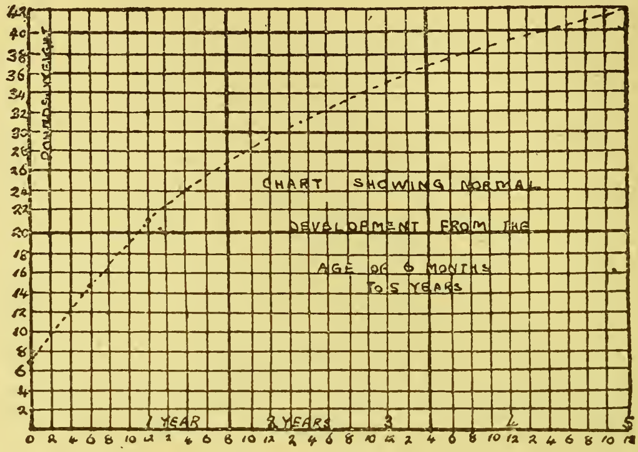

FIG. 7.

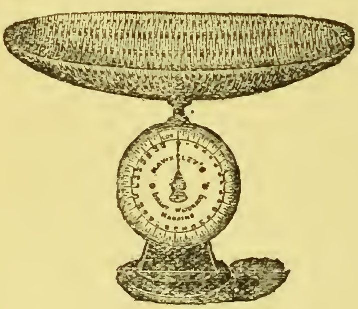

FIG. 8.

The careful watch upon a child which the constant weighing and measuring implies should be thoroughly carried out. It is much more economical even to consider only the labour and anxiety any illness entails; and if it is true that a machine which has once broken down has never exactly the same efficiency as before, there may be an analogy in the human constitution. Granting, then, that a careful watch is being kept upon the child, I may point out the signs of any disorder or abnormality; for, just as it takes very little to throw a child out of its normal course, the evil may be as easily checked and controlled if recognised at the very first.

A general warning may be given at the outset. A mother or nurse should never infer that the appearance of grave symptoms betokens the onset of grave disease. A child may have convulsions owing to undigested food, and there may be vomiting and diarrhœa, with prostration, from biliousness. The rashes characteristic of certain fevers cannot be mistaken; but, apart from these signs, there are few which are not counterfeited in the simplest ailments. A healthy child of six months will cry, and seem to be on the verge of convulsions and collapse, if by any chance its meal is delayed an hour beyond the time. Even a sudden rise of temperature may be caused by mere indigestion. In all cases of such sudden rises, it is well to put the child to bed and watch for other symptoms. *Convulsions* and *persistent diarrhœa—i.e.* as distinguished from one or two loose motions—should be treated as suggested in the section on Diseases. Rest and quietness are the best cure for *vomiting,* with additional care as to diet when the child feels inclined for food.

A mother naturally, and a nurse through custom, takes a certain pleasure in observing the lines of a baby's figure. There are few things in the world so attractive as any ordinary baby's figure. It seems superfluous to suggest that the mother should notice if the shoulders and the hips are on a level, and if the line of the spine is vertical. If they are not, a doctor should be consulted at once. Any abnormality in the figure should be pointed out; but it must be remembered that the proportions of a child's figure differ from those of an adult. Thus a baby's head is proportionately large. In fact, it is only about 50 per cent. larger at ten years old than at birth. The abdomen, also, projects more than in adults. But even so there is a symmetry about a normal child's figure that cannot be mistaken.

There may sometimes be found in one or both of the groins of a young baby an oval swelling, which has a tendency in a boy to descend towards the scrotum; or, usually in a poorly-developed baby, a swelling may appear at the navel, which is a weak spot in the wall of the abdomen. This condition is a *rupture* or *hernia*, and it is more emphasized on coughing or straining. A doctor must be called at once, and usually he can press the rupture gently back—a procedure which must not, however, be attempted by any mother or nurse, as the consequences of an unskilful attempt may be serious—but probably the child will require to wear a truss.

A swelling on the angle of the jaw near the ear, causing pain when the jaws are opened, is also a sign which should not be neglected, as it is one of the chief symptoms of the very infectious disease **Mumps** (*q.v.*). Generally there is a rise in temperature, and in boys the testicles are sometimes swollen and inflamed.

After the shape, the surface of the body will naturally be examined. Roughness of the skin has already been mentioned, and in this connection one may give a warning about the varieties of **Eczema** (*q.v.*). Almost any variety of skin affection is classed as eczema, but there is a vast difference between the roughness of the skin, even when it seems to peel off, and the eczema properly so called, in which the red and tender skin is surmounted by tiny vesicles of fluid. Now there can scarcely be a more troublesome ailment, if the eczema gets a firm hold, and it must be left to the care of a doctor. On the first sign of an oozing inflamed skin, it is far wiser to consult a doctor at once, as the chances of a speedy cure are much better if taken at the beginning. One thing, however, every mother can do—shun the little carelessnesses which give rise to the condition.

A child's skin is extremely tender, and every care must be taken to prevent irritating it. The face and head are the places most commonly attacked by the disease, and the causes of an outbreak in these parts may be either internal or external. Among the latter are east winds, overheating by the fire (some nurses are very ready to sit by the fire with a child sitting in their laps and scorching its face), and parasites. The chief internal cause is indigestion—an unsuitable diet is always a predisposing cause of eczema. The means of avoiding all these causes are sufficiently obvious to need no pointing out. Eczema may also appear in different parts of the body owing to damp napkins being left on the child, or insufficient drying after bathing. Here again the way to avoid the development of the diseased condition by these means is perfectly clear. Wet napkins should never be left on a child, and all the creases should be carefully examined daily to see that no soreness is arising. The child should be carefully dried after each bath, and the creases should be dusted with starch powder. If there is the slightest soreness, a little unscented lanoline or vaseline should be well rubbed into the sore place. Hazeline cream is another good remedy for soreness. If there are other children in the house every care must be taken to prevent the infection of eczema spreading. The towels, sponges, hair brushes, and combs of other children must be kept strictly apart from those of the child which is suffering from eczema. Further than this it is wiser to say nothing. What will cure the condition in one child will only aggravate it in another, and it is much wiser and safer, as well as more economical in the end, to consult a doctor at once.

If a round red spot appears on the scalp or on the body, it should be carefully watched. It is *Ringworm* if the centre fades away, leaving a well-defined ring. As it is very infectious, all towels, sponges, &c., used by the child must be scrupulously kept apart. It is readily cured when on the body, but often difficult to cure when on the scalp. One painting with a solution of formalin is generally all that is necessary in the former case, but if it has not disappeared in two or three days it may be painted again. The solution of formalin may be obtained from any chemist. In ringworm of the scalp, the hair must be cut short in the affected region, and the formalin solution painted well in every two or three days. Another successful method is to paint the patch with croton oil, the affected hairs then falling out and cure resulting.

Rashes.—After eczema there are other conditions of the skin which are even more important to recognise. There are a number of rashes which may be very simple or may be symptoms of the onset of grave disease. A nurse or mother should be able to tell whether the rash is of the one variety or of the other. The commonest rash found in infants consists of small red points, which turn into tiny vesicles of transparent liquid, dry up, and form scabs. A variant of this rash is a crop of tiny red pimples, which cause much irritation. This latter is the so-called "red gum," which is popularly but erroneously supposed to have some subtle connection with teething. Both are known to doctors as *Sudamina*, a word which describes their cause, for they are sweat rashes. The treatment is to allay the irritation by the use of a little carbolic ointment, and remove the cause by seeing that the clothing both at night as well as day is not such as to cause perspiration.

Another variety of rash that is very common, especially in summer, and which is also of very little significance, consists of tiny raised lumps a little resembling what are commonly known as heat lumps, in the midst of an inflamed area. At times tiny vesicles come on later. This is *Nettle Rash*, and the great trouble is that children are prone to attempt to relieve themselves from the irritation by scratching. This rash may be caused by indigestion or by the bites of insects. A little soothing ointment may be applied as in the sweat rash. When the condition cannot be traced to the bites of insects, unsuitable food such as shell-fish, seed fruit, or tinned food may be suspected. These are, however, trivial complaints; but perhaps the reader may be reminded again that a practical experience of three children shows that the graver diseases can be kept off altogether by ordinary care. Many people seem to realise that a sewing machine or motor car cannot be expected to work well and have a long life if it is not used carefully, but do not grasp the fact that the human organism is a much more complicated machine, and demands at least an equal amount of care to yield the best results. There are several diseases which are distinguished by a characteristic rash. Seven of these may be noted here, **Chicken-pox** (*q.v.*), **Measles** (*q.v.*), **German Measles** (*q.v.*), **Scarlatina** (*q.v.*), **Typhoid** (*q.v.*), **Typhus** (*q.v.*), and **Small-pox** (*q.v.*), though it must be remembered that typhoid, typhus, and smallpox are now extremely rare as children's diseases.

It must be clearly understood that, with the exception, perhaps, of chicken-pox, these rashes are preceded and accompanied by other and more conspicuous symptoms. I have known of a case of chicken-pox in a doctor's family which was only noticed by accident. The rash is not very prominent, the temperature [1] seldom high, and the child does not complain of being ill, and plays about as usual. In the case of which I have spoken no special treatment was given, except a little extra care about draughts and attention to diet, and the child was kept within doors. In general the vesicles continue to come out for several days, last a day or two, then form scabs, and drop off.

While there is any raised temperature it is safer to keep the child in bed, and this also applies to the period during which the eruption is noticed. Apart from this, and a little extra care to keep the diet light, there is nothing that need be done. But the child should be isolated for from three to four weeks—*i.e.* until the skin has resumed its healthy condition again, and even this does not cut off all risk of infection. A nurse or anyone attendant on the child can carry the infection by her clothes, and it may also be spread by toys and books. It is best, therefore, to burn the toys and books that have come in contact with the child, unless they can be (and are sufficiently valuable to be) thoroughly disinfected by being left in an atmosphere which is impregnated with formalin.[2] An overall worn while with the child, and left off before visiting other children, will prevent the carrying of infection by clothes. A solution of formalin can also be obtained and sprayed about a room.

The fact that this is an infectious disease suggests that a little care as to the children with whom one's own children are allowed to mix may prevent a mother having any practical experience of this and the other infectious diseases. This is my own experience, and it is corroborated by the fact that the onset of infectious diseases is generally coincident with the time at which a child first goes to school.

In each of the other rash diseases there are symptoms which appear before the appearance of the rash, and there are graver symptoms that accompany it. **Measles** not uncommonly starts as what seems to be a rather heavy cold. The temperature rises, the eyes and nose run, and there is often a hoarse cough. The "cold" occurs about ten days or a fortnight after exposure to infection, and on the fourth or fifth day after the appearance of the "cold" symptoms the rash appears. As the period when infection may be taken from the child commences with the appearance of the cold, it is well to isolate any child who seems to have a heavy cold and is suspected of having been exposed to infection from another child, for four or five days. In known cases of measles, isolation should be maintained for about three weeks from the onset of the disease.

The time, perhaps, has now passed when it used to be thought that measles was a negligible complaint, but it is necessary to insist that it not only is not negligible, but is one of the gravest diseases from which a child can suffer. No attack is really to be considered mild or slight. In a "mild" case the rise in temperature is small, the rash is slightly marked, and the child really seems to have simply a very heavy cold, unless the rash is noticed. If it is not, the case may pass unrecognised as measles, while it is always a source of infection, and is liable to the dangerous complications which are so marked a feature of measles. The danger that this may occur is sufficiently grave to suggest

[1] As the temperature is of great importance as a symptom of disease, it may be well to describe briefly how to take a temperature. It is a thing every mother and attendant on children should know. The thermometers used for this purpose are called clinical, and are made with a long bulb; as a rule they do not register beyond 110 degrees Fahrenheit, and are not marked beyond three or four degrees below the normal heat, 98·4 degrees Fahrenheit. The thermometer should be kept perfectly clean, and never put away without being first carefully washed; if there is any suspicion of infectious disease, it should be washed in a little disinfectant. Before taking a temperature the thermometer should be shaken to send the mercury back into the bulb, as these thermometers are so made that the mercury does not otherwise fall back into the bulb. If a quick reading is required the best place to take the temperature from, is the mouth. Place the bulb of the thermometer carefully under the tongue for a few minutes, instructing the child to keep its mouth closed and to breathe through its nose. A better place, if the child can be expected to remain quiet for ten minutes or more, is the armpit. The thermometer should be placed under the arm, and the arm should be drawn down to keep air away from it. The external opening of the bowel is another place where the temperature may be taken, and perhaps this is the best place where there is a touch of delirium. The thermometer should be placed well inside, and the reading be taken in a few minutes.

[2] Formalin is so good a disinfectant and the method of using it so easy that a little explanation may be made. When it is required to disinfect anything—clothes, toys, a cot, or perambulator—a room should be selected which can be made fairly air-tight. The window should be treated by putting cotton-wool between the sashes, the spaces round the corner of the window should be similarly treated, and sufficient packing should be kept for the door. Some tabloids of formalin—three or four will do—should then be placed in any receptacle over a lighted spirit lamp. Place this well in the room near the articles which it is required to disinfect, and then close the door, block up all the spaces round it, and leave the room locked for six or seven hours. Then the room may be opened, and with a wet cloth round the mouth and nose, the nurse should step quickly to the window, throw it wide open, and then leave the room for an hour or so, when the fumes will be sufficiently diffused to make it possible to enter the room without discomfort.

to every mother the advisability of carefully examining any child with symptoms of a heavy cold for a rash.

The best advice to anyone who finds that her child has measles is to put it to bed at once in a warmed room. A large sheet moistened with a weak carbolic acid solution should be hung over the door, and a mother who has to attend other children should cover all her clothes (which should not sweep the floor) with an overall also impregnated with carbolic acid solution, and this should be rigorously worn when attending on the infected child. The room should be well aired, a little darkened; the diet should consist of milk, soups, &c., water should be given freely, and the bowels kept open. Dinneford's magnesia is a very good preparation, though there is a tendency in measles to diarrhœa. If there are marked chest symptoms, if the cough is troublesome and the breathing bad, the air of the room is better kept moist by the use of a bronchitis kettle. The time when the greatest care is needed is during convalescence and after recovery. Every care should be taken that the child may not catch cold, as measles often leaves a weakness of the constitution behind, and the first few months after recovery the health should be very carefully watched.

In cases of *Scarlet Fever, Typhoid, Typhus*, and *Smallpox* a doctor should be sent for at once, as soon as the disease is recognised. The ordinary precautions against infection should be carried out as described above. It will naturally be remembered that nothing which has been used by or been near an infected person should be used without thorough disinfection. One or two remarks may be made with regard to the symptoms which precede the appearance of the rash.

The first symptom of **Scarlet Fever** or **Scarlatina** in young children, is usually headache and vomiting; this is very commonly *accompanied by sore throat, diarrhœa*, and a high temperature.

Smallpox usually begins with a fit of shivering, fever, intense headache, vomiting, and constipation; occasionally the attack commences with convulsions (*q.v.*).

The first symptoms of **Typhoid Fever** are not as a rule sufficiently characteristic to enable the inexperienced to recognise the onset of the fever. There is headache, a flushed face, a feeling of tiredness, discomfort, and feverishness. It is this last point which must be specially noted. The temperature rises at night, and falls again towards morning. But each succeeding night the temperature is higher until about the eighth, when it generally reaches a maximum at 104° or 105°.

As typhoid fever is generally a long illness care must be taken to avoid *Bedsores* (*see* **Nursing**). Any part of the body on which the weight of the body rests, such as the lower bony part of the back, the hips, and heels, should be rubbed daily with brandy or methylated spirits, and then powdered with zinc oxide, starch powder, or boracic powder. This is, of course, a preventive measure. There are others of a simpler nature which do not, however, do away with the necessity of the above treatment. The parts mentioned should be scrupulously cleansed daily and dried with a soft towel, after which the treatment should then take place. Every effort should be made by the nurse to give the child a number of changes of position, so that no part is used so much as to produce tiredness or aching; the under-sheet should be carefully kept without creases.

These precautions should always be taken when a child is in bed for any length of time. Three or four days is the maximum before commencing the treatment for the prevention of bedsores, and with children who have little flesh on their bones the time may advisably be even less. If the bedsores do actually form, the care of them had better be entrusted to the doctor, for they are very hard to cure. Where it is possible, it is of course better to put the child on a water-bed.

Typhoid fever is more than usually troublesome owing to the strange ways in which infection may be spread. The stools and urine may carry the infection, and consequently precautions must be taken against this. Fortunately it is not very difficult to prevent infection from this source. The excreta should be mixed at once with about the same amount of strong disinfectant—a solution of carbolic acid, one part to five of water, or a lysol solution, one part to twenty of water. The latter is probably more convenient for most purposes, as it is readily obtained at a standard strength. No stools should be thrown into the drains until this preliminary treatment has been carried out. All washable clothing should be steeped in a one-in-twenty carbolic acid solution, or water with a few drops of lysol, for some time before being removed from the sick-room, and then boiled before being sent to the laundry. The nurse should also wash her hands in warm water with soap, and then steep them for a few minutes in water to which a little lysol has been added, before touching any article of food.

One final word may be said with regard to typhoid fever. It is generally caused by a polluted water supply, and if the infection is not derived from water it is probably from milk. This fact suggests a valuable preventive measure. If all the drinking water of the house and the milk are boiled, there is not very much danger of infection from this disease, as the boiling kills the germs. This is a precaution which should obtain in every household. The water should always be boiled, and the milk which is used for the children should be boiled as long as it is drunk in any quantity, and this for a great many years of life.

Typhus Fever has several marked differences from typhoid fever. It is generally associated with over-crowding and insanitary conditions, and is therefore most common among the poorer classes of the community, while typhoid may attack people of any station of life when the water supply has become contaminated through any means.

Typhus may be carried from person to person by clothing, but not, so far as is known, by drink or food, whereas the opposite is the case with typhoid. A recent theory suggests that the infection is carried by fleas. The beginnings of typhus are not very distinctive. A child may at first merely complain of feeling tired and languid. This may pass unnoticed, but the second stage is more marked. The child feels very ill, weak, and there is a sensation of chilliness, and the child may be taken with shivering. At this point bad headaches are experienced, and there is loss of sleep. Fever is soon noticed, and the temperature almost at once reaches a high level, and maintains it for some days. There is a maximum about the seventh day, but the temperature does not fall much beyond a degree until about the fourteenth day, when it very rapidly subsides, sinking to the normal in two or three days. Associated with the headache and other preliminary symptoms there is a white fur on the tongue, which later becomes brown and dry. Although the mortality from typhus fever is small among young children, great care is necessary. The child should, as in all fevers, be isolated immediately there is any suspicion of infection. The precautions about disinfection of clothing and utensils should be carefully carried out, and for the rest attention must be paid to keeping up the child's strength by the administration of milk and soups. Care must be taken in the stage of convalescence.

The first symptoms of **Smallpox** are characteristic. About a fortnight after exposure to infection fever manifests itself, which rises to 104° or 105° almost at once. Headache, thirst, constipation, pain in the lower part of the back, and vomiting are also present. Sometimes there are convulsions. The tongue is furred, and there is a complete distaste for food. On the third day from the outbreak of these symptoms the rash peculiar to smallpox may be noticed, almost always first on the face.

At the same time the fever generally falls considerably. Two or three days after the appearance of the rash the hard little lumps are seen to contain a clear fluid. This disease is almost always best treated in hospital, since it requires trained nursing and numerous precautions which cannot be obtained elsewhere. Among poorer families it is imperative to have the child removed to a smallpox hospital, and among the better classes it is advisable, for the sake of the possible disfigurement which the child may undergo in any but the most skilful hands. A word may, however, be said about precautionary measures. The necessity for having every child vaccinated according to the prescriptions of the English law cannot be over-emphasized. Since the introduction of the vaccination of infants, the disease, which was formerly peculiar to infants, has become an adult disease, and the cases of infants who have been efficiently vaccinated becoming infected are very rare indeed. And even where young children have caught the infection the cases have been very slight. The efficiency of the vaccination can safely be left to the officer whose business it is to perform the vaccination in the district. Every mother is at liberty to have her child vaccinated by her own doctor. An ordinary healthy child suffers very little indeed from vaccination. In fact, although the limb may be a distressing sight for the nurse or mother, it seems to cause hardly the slightest trouble to the child. It is not necessary to have children vaccinated on the arm, and this is a point that a mother of girl babies may bear in mind in view of her child being disfigured for the wearing of evening frocks.

All who have been near a child suffering from smallpox should be vaccinated at once. It is by repeated vaccination that doctors and nurses in contact with smallpox patients protect themselves from contracting the infection. Smallpox (and vaccination may be included in it) generally confers immunity from the disease; but the immunity conferred by vaccination is somewhat similar to that given by an attack of influenza in passing away after some time. All clothing which has been in the room of a child suffering from smallpox, and all furniture, should be disinfected. If the room can be closed up and efficiently fumigated by formalin, as described on p. 108, this is the most convenient method.

After rashes which are conspicuous and mark a good part of the body there are subtler signs, indicative of ill-health and disease. The face is a book which the mother should learn to read. When it is flushed for any little time—it is well to make sure that it has not been scorched by the nursery fire—it indicates fever. The thermometer will confirm this and give the degree of fever, and by its varying readings suggest the identity of the fever. A really ill and haggard look is worth many apparently graver signs as an indication of sickness, as these signs may be produced by quite trivial ailments. A constantly open mouth, with a somewhat stupid look, is a sign of the probable presence of **Adenoids** (*q.v.*). In this case the nose may look a little pinched, the face may be pale, and there may be a difficulty in breathing and in speaking. As adenoids have a very bad influence on the general health, if the above symptoms are present it will be well to see a doctor, for the condition may be removed very quickly and with little trouble.

The *mouth* of a child from its earliest days must be carefully watched. At the time of teething, the gums are often inflamed and tender, and whitish or greyish little patches may appear on the membranes of the mouth. At times there are even small ulcers. The soreness may be soothed by applying honey and borax, which any chemist will make up. A graver condition is the growth of small raised white patches on the membranes of the mouth. This is called **Thrush** (*q.v.*), and its appearance may be taken as an indication of feeble general health. Thrush may be removed by applying borax and honey, but the condition requires general attention to the health of the child, a sufficiency of digestible food, and plenty of fresh air. If the child is still at the breasts special care must be taken to cleanse both the nipple and mouth before and after a meal.

The *tongue* is a good indicator of health or disease. A furred tongue is a characteristic of several fevers, as has been pointed out already. Affections of the tonsils are sometimes associated with a slight fur on the tongue, and a discoloured tongue is often an indication of indigestion or constipation.

The *tonsils*, the two oval-shaped glands which form the side boundaries to the opening of the mouth into the throat, can be readily and should be frequently examined. A swollen and red condition may indicate a cold, or scarlatina. If the tonsils are chronically enlarged, a doctor should be seen and they should be removed. If the tonsils are red, swollen, and covered with spots of a yellow secretion, this is a symptom of scarlatina. If the tonsils and uvula are dark red, and swollen, and the child complains of headache and sore throat, and the glands under the jaw are swollen, these may be taken as the early symptoms of **Diphtheria** (*q.v.*). If white patches of membrane appear on the tonsils and spread to the uvula and soft palate, the diagnosis is fairly certain, and the doctor must be sent for at once. It is a wise precaution to isolate the child immediately the tonsils and uvula show the dark red and swollen appearance, as diphtheria is a very infectious disease. It is also necessary to send for the doctor as soon as there is any suspicion of diphtheria, as it can be readily cured if taken early, but otherwise its course is apt to be short and fatal.

Colds may next be considered. It has already been pointed out that what looks like a cold may often be the beginning of measles, and hence colds among young children cannot be treated in the offhand manner which adults often adopt. The measles "cold" has already been described, and it may generally be said that where there is a heavy cold, with a raised temperature, and a hoarse cough, it is better to isolate the child at once. The treatment of a cold and of the early stages of measles is much the same. The child should be kept in bed in a warm temperature, and the diet should be light and nourishing. Milk, bread and butter, and milk puddings may be given, and the bowels should be regulated by the use of some simple aperient such as Dinneford's magnesia. If the "cold" should turn out to be measles, the rash will be noticed about the fourth day. Otherwise, if there are no further developments the child should not be kept in bed; but precautions should be taken against fresh chills

One very common development of a cold is **Bronchitis** (*q.v.*). In a typical case there is a raised temperature, three or four degrees above the normal, breathing is hurried and forced, and there is pain behind the chest-bone. The treatment of bronchitis consists in keeping the patient in bed in a room the temperature of which is from 65° to 70° both night and day. The cough and breathing may be relieved by allowing a kettle with a long spout to boil away in the room. A little tincture of benzoin may be added to the water. There should be plenty of air in the room, but the bed must be kept out of the draught. The food should be light and nourishing, milk and soups for children who are not at the breast. The bowels should be kept open.

A disease which at times supervenes on an attack of bronchitis is **Whooping-cough** (*q.v.*). This is an extremely infectious disease, and may be conveyed from one child to another, and even by clothing, if this has been touched by the vomit. The disease commences like a cold on the chest or a mild attack of bronchitis; but instead of the cough subsiding it increases and tends to come in paroxysms, and at length the paroxysms become frequent and the cough ends with the familiar whoop. At this stage vomiting follows the paroxysms, and while the cough is on there are symptoms of suffocation. The air is violently driven out of the lungs, and the failure to get sufficient in causes the child to grow livid in the face, and the eyes seem to be on the point of bursting from their sockets until the whooping inspiration comes. The disease cannot be neglected, and the high mortality in the past is due to the sort of familiar contempt in which it has been customary to hold the disease.

The complications to which whooping-cough is liable prove that it is not a disease which can safely be treated without the help of a doctor. If the whoops are not very frequent there is little danger, but where they are frequent, and where the child is weakly, every care must be taken. If the weather is mild, the child need not even be kept indoors, but it must be warmly clad, and there must be no risk of infecting other children. If the weather is not fine, or there are troublesome east winds, the child should be kept indoors, but there is no need to keep it in bed unless there is fever. The health generally must be seen to: light wholesome food should be given, and the bowels should be attended to. This is all that is required in a mild case, although the tendency to whoop may remain for a long time after the disease seems to have disappeared. In these cases a change of air, a short visit to the seaside, will finally put the disease to flight. In severe cases drugs may have to be administered, but these must be left to the doctor.

A condition which is associated with children above two years old is **Croup** (*q.v.*). The child goes to bed apparently well, and in the middle of the night is waked by great difficulty in drawing in its breath, and there is a metallic cough, the air being drawn in with a loud noise. The child later becomes livid, and has to struggle for its breath. At times the attack is accompanied by convulsions. The seizure does not last long, but it may come on the next night. The treatment is to put the child at once into a bath of hot water, and when it is taken out a kettle may well be allowed to steam the room, a little tincture of benzoin being added to the water. If the treatment is carried out promptly there is no cause for alarm.

When a nervous child has been crying or is excited, there is sometimes a peculiar crowing sound heard as it draws in its breath. The child holds its breath until it is blue in the face. When the spasm is over, the inspiration is of the peculiar crowing nature. The treatment is to slap the child on the back, shake it, or throw cold water into its face.

The greatest trouble of a child's digestive system, Constipation, has already been mentioned. There are one or two others which should be noted. After unsuitable food (in breast-fed infants this may be on the mother's part) a child sometimes screams with pain, kicks his legs about, and gives every indication of suffering from great pain. Massage of the abdomen with the warm hand or hot flannels will generally give relief. If the child is suffering from constipation, an enema may be given (or in older children a dose of castor-oil).

Diarrhœa (*q.v.*) may be of a simple type, in which merely the number of motions each day is increased, and due to weaning, to the baby's diet not being quite suitable for it, or to teething. The addition of lime-water to the milk, or the substitution of diluted condensed milk or one of the artificial foods (according to the age of the child, as noted before) for the modified cow's milk, may be enough to stop the diarrhœa. Beef-tea and broth which have been given rather too strong may often be the cause, and should then be given weaker and in smaller quantity, or stopped for a time.

Catarrhal diarrhœa, in which the stools are slimy and mixed with mucus, is often due to the irritation of teething, or to indigestible food, or a chill. The cause should be treated, and a small dose of castor-oil given to clear away any cause of irritation.

Summer diarrhœa, or epidemic enteritis, which occurs chiefly in June and July, is a serious condition which causes a very great number of deaths among children, and is due to certain micro-organisms. To prevent it the milk must be sterilised, as already directed, and prevented from being contaminated from any source. A doctor must be called in at once to treat the condition.

Diarrhœa is a symptom of many of the fevers which have been described above, and of other serious conditions, and if the condition does not yield to the simple treatments which have been given, it is foolish to put off calling in a doctor.

Children who are carefully fed in ordinary well-regulated households do not generally suffer from **Worms**. These are hatched in the bowels from eggs which have been conveyed by drinking-water or by imperfectly cleaned vegetables, and are of two kinds, thread-worms and round-worms. Thread worms are white and thread-like, the largest less than half an inch long, and their presence is shown by the child's restlessness, wasting, irritation at the nose, and itching at the exit of the bowel, while in females the worms may cause much discomfort if they reach the vagina. Sometimes the worm can be seen in the stools. The treatment is to give an enema of strong salt and water every second night for a week, and, if there is no improvement, one or two teaspoonfuls of castor-oil should be given by the mouth, or a doctor may give other drugs to kill the worms. The exit of the bowel, and also, in a female, the region of the genital organs, should have a mercurial ointment applied to soothe the irritation. Round-worms are like the common earth-worms, and may be about 10 inches long; they exist in the upper part of the bowels, and the symptoms denoting their presence are very vague. If the child has digestive derangements, irritation of the nose or external opening of the bowel, and general wasting, round-worms may be suspected, and a doctor should be consulted, who will treat the child with drugs to kill the worms.

MENTAL DEVELOPMENT

If the bodily health of a child is a simple matter when due care is paid to certain rules which are almost too obvious for it to be necessary to lay them down, the same cannot be said of its mental health and growth. Hardly anything can be worse than a habit of "tinkering" at a child's mind. A child certainly starts its course without preconceived notions of the world into which it is born, but it is just as certainly endowed with certain powers and aptitudes which express themselves and develop with physical growth. Very early in life a child begins to use its mind; and while it is very important not to stimulate it too much, it is equally important to know what are signs of arrested development.

The normal stages in a baby's development have already been described, and it has been suggested how far such developments may be delayed without causing anxiety. There is a great deal of elasticity about the periods when children walk and talk, but abnormal delays in these natural evidences of growth must be taken as symptoms of something wrong. With an overwhelming majority of children no such trouble will occur, and the problem is how far conscious and deliberate efforts should be made to educate a child in the first years of life.

The word *education* admirably expresses the character of mental development, for it means a leading out and not a putting in of ideas; and when this is grasped it becomes perfectly clear that the surroundings of a child are probably just as efficient educators as the best instructors. A child learns its first notions of the universe from its play and its toys, though as it grows older it will demand answers to a host of questions which these and the ordinary things in a house or nursery suggest. The mother's responsibility, which commenced with the direction of the child's environment, in the arrangement of the nursery and clothes, &c., begins here, with a force of quite a different character. Makeshift, contemptuous, humorous, or cynical answers, should never be given to a child, however young. A parent should do his or her level best to give a simple and satisfactory answer to the child's questions. This is at times extremely difficult. Indeed, one answer may suggest a dozen other insistent "whys." Yet a parent should realise that it is a crime to tell an untruth to a child, through, for instance, some mistaken notion of prudery, and that however great the effort to give a fair and simple answer to a question, it is well worth the trouble to set a child on its course without furnishing it with a mass of mental furniture of which it must unburden itself sooner or later.

A child's moral future is sown in the same early days as its intellectual future, but the troubles and difficulties of training a child's mind are both multiplied and simplified here. Example is the best teacher, and a mother need say very little in the way of moral correction if her own behaviour is uniformly good. But for this who is sufficient? Prohibitions from petulance or pique should be shunned as a pestilence. A child should always be given what it wants if it can be readily obtained and is good for it. If the fulfilment of its desires would be hurtful—for instance, the staying up late at night—the child must be told simply the reason, and after that it must be trained in habits of simple obedience.

There is no justification for controlling a child's tastes. If it wishes to wear crimson satin (and it is procurable), in which it would look hideous or startling, it is very unwise to forbid it. The child should be told that it is an unsuitable dress; and when this has been enlarged upon, if the child persists, it should be allowed to make itself hideous. It will soon learn if the taste of those about it, and the pictures and decorations of the home, are beyond cavil. I do not think there can be much worse influence on a child's mental and moral development than the conviction that it is hampered by arbitrary commands and prohibitions.

Yet discipline is one of the best things for every child. When a mother has come to any decision (and, as I have pointed out, this should demand at least as much thought and care as in her own affairs), it should be adhered to inexorably, in spite of all an imaginative and subtle child's wiles. Promises and threats (these, of course, must be reduced to a minimum) should be fulfilled in face of all difficulties. A threat which is not meant and a promise unfulfilled are evils which can hardly be equalled in the treatment of a child.

The performance of dangerous actions should not be prohibited or prevented so much as persuaded against. If a child wishes to touch a jug of hot water, for instance, it is better to tell it clearly that it is hot and will hurt him, rather than move the jug away. The mother should be at hand to see that no evil results; but if the child insists on touching it, he will do so more tentatively, and will merely experience sufficient sensation of discomfort to show him that obedience would have been better.

The question of punishments is full of pitfalls. A child should never be punished in temper, or punished by its fears. Indeed, fears should be rigidly excluded from its experience. No nurse should be allowed, and no mother should allow herself, ever to suggest "bogies" or "ghosts" or "robbers." A child's imagination at times is difficult to cope with in this respect. My second child, when only 2 years old, insisted that when the nursery door was opened "a draught with a blue face" came in. This arose simply from the fact that she had been told to keep away from the open door because of the draught.

For the rest, a child's mind may be agreeably and sufficiently stimulated by the telling or reading of stories. Probably it is much better to read the stories, as many excellent children's books can be had nowadays which cause a child of 3 or 4 years of age very little difficulty to understand. In the *Told to the Children Series*, published by Messrs. Jack (cloth gilt, 1*s*. 6*d*. net; ornamented boards, 1*s*. net), there are very few words the meaning of which a child needs to ask. The stories become very real to the children, and I have found, on a wet day when tempers are becoming a little difficult, nothing has such a soothing effect as the reading of one of these books. At times a young child may on another occasion be asked to tell a story—say, the story of the Argonauts. The mother or nurse may be tired, and if she tells the child this and asks her to tell mother a story instead of having one read to her, the child is often eager enough to do so. This is a most excellent exercise for a child's mind. The mother can suggest where the child has missed an essential point, showing how essential it is, and the mental training is thus interestingly and easily begun.

But apart from this conscious training, the stories unconsciously stimulate a child. One can hear them calling their dolls Theseus, Perdita, Geraint, &c. &c., and then asking them very pertinent questions as to their behaviour. At times the children add variations to these famous stories, which give a new, a bizarre, sometimes perhaps an improved, turn to the tragic fates of their heroes and heroines. "Theseus is now going to—" is the formula; and Theseus finds herself in a new and happier or, perhaps, more topsy-turvy rôle. My own view is that no further education is needed up to 5 years of age than this incidental sort which comes from merely filling dull hours with intelligent recreations, and being honest, fair, and firm in the daily questionings and difficulties of nursery life.

CHOICE AND DUTIES OF A NURSE

Wet Nurse.—If a mother is unable to feed her child and can afford a wet nurse, it is much better to procure one than to feed the child artificially. The nurse, however, must possess certain qualifications. Her child must not differ much in age from the child she is going to nurse. She must be strong, healthy (a medical examination is advisable), and equable in temper.

Choice of a Children's Nurse.—Too great care cannot be taken in the choice of a nurse. Hardly any position is so full of trust and responsibility, since the health and character of children in after life will to a large extent be determined by the treatment they receive in the first years of their life.

A good nurse ought to be fond of children, good-tempered, and thoroughly trustworthy. She must be healthy and active, bright and happy-looking, and capable of gentle firmness. It is important also that she speaks well and has no defect or peculiarity of any kind, as children are very quick to imitate both the bad and the good.

Personal cleanliness is another important qualification; and, as regards dress, this must always be neat and tidy and very simple in style. It is not always advisable to insist on nurses wearing white, since the continual glare of everything white, especially out-of-doors, is not considered good for a baby's eyes, and the washing is a consideration, as white, if worn at all, must be spotless. A soft grey or navy blue is preferable, or grey might be worn in summer and blue in winter. The morning dress should be of linen or other washing material, and for the afternoon alpaca, beige, or serge would be suitable. An apron should be worn indoors. The out-of-door costume should be quiet and neat. There is no occasion for her to wear the uniform of a hospital nurse. A jacket or coat to match the dress in colour, and a hat or bonnet with a ribbon trimming, are perhaps the most suitable.

A nurse should be a good needlewoman. She may not be called upon to make new garments for the children, but she is generally expected to keep their clothing in order and do little renovations.

A knowledge of laundry work and simple nursery cookery are also useful acquirements; and if she has experience in treating the simple ailments of children, or knows what to do in a case of emergency, she will be all the more valuable to her employer.

Unfortunately, it is not always easy to find all the above requirements in one woman, and this makes it all the more important that the mother should always take the chief supervision. In fact, it is one of her first duties; and she ought under all circumstances to reign supreme in her own nursery; and no matter how clever and experienced the nurse may be, it is never right to give her the full control of the children.

Duties.—As regards the duties of the nurse, there must be a plan and a time-table; but it is for every mother either to make her own, or to do so in consultation with her nurse, and then to see that it is adhered to. The duties will naturally vary with the size of the family and the number of servants kept, and the mode of living. Where there are several children and two nurses are kept, the head-nurse will have the entire charge of the infant. She will always be responsible for the care of the other children, but the under-nurse or nurse-maid will assist with their dressing, &c. She will be responsible for the order and management of the nursery, the arrangement of meals, &c. The under-nurse will do all the rough work, including cleaning, washing of dishes, carrying coals, and work, under the direction of the head-nurse. When the nurse is single-handed and there are several children, she will either require help from the housemaid in the cleaning of her nurseries, or the mother must be prepared to take the children for a certain time each day in order to give the nurse some freedom to do a little washing or cleaning. By this means she ought to be able to get through much useful work.

A University Woman.

HEALTH IN CHILDHOOD

INTRODUCTION

No period of history has been more concerned than our own with the study of childhood, whether from the point of view of the cure and prevention of disease or that of mental and moral education. And surely there is no science so pregnant with possibilities as this, which has as its aim the elimination of all that is productive of inferiority, whether it be physical or mental, and the production of a superior race.

It is only by the proper nurture of the child from his earliest days, long before he is born, that we can hope for any great improvement. The aim of the Eugenists is to seek to educate public opinion to a greater ideal on the question of the reproduction of the human race. Great care is exercised in the matter of breeding animals, to ensure that the very best are the progenitors of the future race. Not only is there selection beforehand, but every care is taken that, during the immaturity of the young animal, the mother is under the best surroundings. Surely the time has arrived when the human mother should receive every care during this critical time.

There is no doubt that the public conscience is awakening to the crying need of some form of control. In the case of the feeble-minded the question of further restraint has become of such pressing importance that Parliament is considering legislation dealing with it. There is an enormous number of feeble-minded people in this country, and those who contribute to this total, in many cases, come from families where there was previously weakness of intellect. Many are the illegitimate children of weak-minded women, who have been subject to no control, but allowed to go on populating the country with children, of whom a large number will also belong to the same class of the mentally defective. We do not suggest that all cases of feebleness of mind arise in this way, but a very large number do. If steps could be taken to stamp out this persistent source of weakness to the community, much would be done towards dealing with a difficult problem.

There are two solutions to this question. One is to segregate all feeble-minded persons, keeping the sexes apart. This, on account of the expense involved, is unlikely to be undertaken. Besides, it is unnecessary to resort to what is virtually imprisonment, for the other solution is a comparatively simple one, and obviates any necessity for separation of the sexes. This second alternative consists in the removal of the power of procreation. Mr. Hall Edwards has suggested a simple, painless, and effective method of producing sterility without interfering with the liberty of the sexes. This consists in the exposure of the reproductive glands to the X-rays. Those who talk of the interference with the liberty of the subject, and the resort to barbarous practices, might well give a little more consideration to the welfare of the child. How can a child, even supposing he is normal, with one or both parents feeble-minded, be reared with proper care? He doesn't have a fair chance. The care of the child is a higher ideal than the care of the parent, for the well-being of the child is the salvation of the race, and the welfare of the race, as compared with the liberty of the individual, is paramount. This idea is universally recognised in so far as those who commit crime against the public weal are subject to drastic punishment by the curtailment of their liberty. This being so, wherein lies the heinousness of protecting posterity by the interference suggested?

Further awakening of the public conscience is required in reference to the care of the mother before her child is born. In many cases the mother has to work in factories and elsewhere until shortly before his birth. This must have a deleterious influence on the child. Then, too, there is the fact that in his early days, owing to the mother having to go to work, the little infant is left to the tender mercy and ignorance of some older sister or the carelessness of some neighbour, who for a pittance undertakes to look after him, with probably half a dozen more. Small wonder that under these conditions the infantile mortality is high. The crippling in health, too, of those who do not succumb, often paves the way for an unhealthy childhood and a decadent manhood.

Not only is the child handicapped through inefficient nursing, but his surroundings are often so detrimental to his physique. This is particularly the case in towns, where large numbers of people are crowded into most inadequate accommodation, often consisting of only one room; where the houses are massed together, and back-to-back premises predominate; where the sun seldom enters, and the air is always impure. What is wanted is more air, more sun available for everyone. This long-felt want is supplied in part by such open spaces as parks, where the children can play. But the housing conditions require altering. Forward steps are being made, but they are so slow. There is the Housing and Town Planning Act, which was passed not so long ago, and which provides for the inspection, condemnation, and closure of houses which are overcrowded and unfit for habitation. It also provides for the erection or improvement of working-class dwellings, and advocates more open spaces.

The physical condition of the average child has been creating much concern in the minds of thoughtful people. This culminated five years ago in the adoption of medical inspection throughout the elementary schools. Much was expected of this scheme, and much has been done. But the scheme is far from perfect yet. Defects are discovered in thousands, and in many cases before serious harm has arisen, but the plans for seeking to remedy these defects have so far proved unavailing in the majority of cases, owing partly to the apathy of the parent, partly to ignorance, but chiefly from inability to pay for the necessary treatment. Until there are adequate facilities for obtaining treatment at a reasonable cost, this great scheme must prove abortive. A large number of parents are being educated through the medium of medical inspection and associated agencies, a larger number of children themselves are being taught the right principles of hygienic living. All these seeds may not bear much fruit in the immediate future, but they are bound to produce better results in the next generation. Our aim is the betterment of the individual, and through him the improval of the race.

The problem of child welfare has been approached from various points of view, but in this article the aim is to try and present the main features requisite to the physical and mental health of the child. An attempt is made to show some of the principles underlying the adoption of certain rules, and thus to form a rational basis of healthy living.

GROWTH

Under this term we propose to say a few words about certain conditions in which the child differs from the adult. One of the most noticeable is the increase in size which is known as growth. This implies a relatively larger intake of food, for the body has not only to keep up its existing condition, but has to increase in size and efficiency. This growth varies considerably in different individuals, depending partly on racial and partly on hereditary characteristics. However, the examination of large numbers of children furnishes data which give an average idea of the height and weight of boys and girls at various ages. The height is usually taken with the boots off, the weight in the indoor clothes without boots. The accompanying table gives the average height and weight for children of all classes, town and country, of the general population of Great Britain. It is compiled from the statistics obtained by the Anthropometric Committee of the British Association :

	Males.				Females.			
Age last Birthday.	Height.		Weight.		Height.		Weight.	
	Ft.	Ins.	St.	Lbs.	Ft.	Ins.	St.	Lbs.
5	3	4	2	12	3	3	2	11
6	3	7	3	2½	3	6	2	13¾
7	3	10	3	7¾	3	8	3	5½
8	3	11	3	13	3	10½	3	10
9	4	1¾	4	4½	4	0¾	3	13½
10	4	3¾	4	11½	4	3	4	6
11	4	5½	5	2	4	5	4	12
12	4	7	5	6¾	4	7½	5	6½
13	4	9	5	12½	4	9¾	6	3
14	4	11¼	6	8	4	11¾	6	12¾
15	5	2¼	7	4¾	5	1	7	8¼
16	5	4¼	8	7	5	1¾	8	1

Growth is most active during the summer months. Boys at first grow more rapidly than girls, but from 12 years to 14 or 15, girls, as they approach puberty earlier, develop more rapidly and increase in size at a greater rate. Boys continue to grow at an age long after girls have ceased.

It is advisable to have children measured and weighed at frequent intervals, in order that some definite idea may be gained of their growth, for this may have an important bearing on their health. Children who are growing very rapidly are using up a good deal of energy. This results in a diminished power of mental application, and consequently work suffers in such cases. If there is a considerable increase in height beyond the average, especially if this is not attended with a corresponding increase in the weight, the child should be medically examined, as such a condition may indicate the onset of disease. Similarly, if there is a comparative cessation of growth, the same apprehension should be aroused. The stoppage may be due to insufficient or improper feeding, a deficiency in the amount of clothing, too close an application to mental work, excessive work, or insufficient sleep, apart from any disease.

School work tends to retard growth, but holidays to accelerate it. It is important, in weighing children regularly, to make sure that the amount of clothing is about the same, and that the weighing takes place about the same time in the day. It has been found that in a child of 10 years there may be a variation of 1½ lbs. between the morning and evening weight. This difference is due to the ingestion of food and drink during the day, and the loss of moisture from the body at night time. Usually about the age of 6 years the permanent set of teeth begin to erupt. The order of emergence varies considerably in different children, but the following table shows the average :

First molars	6 years
Lower central incisors . . .	7 ,,
Upper central incisors . . .	8 ,,
Lateral incisors	9 ,,
First bicuspids	10 ,,
Second bicuspids	11 ,,
Canines	12 ,,
Second molars	12 to 13 ,,
Third molars (wisdom teeth) .	17 to 30 ,,

The first to erupt are usually the first molars. They come just behind the last of the temporary teeth, and are especially important, as they are so liable to early decay, owing to such close proximity to the decayed temporary molars.

Nearly all the tissues in children are more active than in adults, consequently there is a greater heat-production, but there is a greater heat-loss to counterbalance this.

The normal temperature of children is higher than in adults. It takes very little to raise the temperature in a child—nervousness, excitement, and exertion, and consequently it is important for a person not to worry unduly should her child exhibit a raised temperature, provided he seems otherwise quite well. The breathing, too, is more rapid and more irregular than in the adult. The pulse-rate is quicker, gradually diminishing in frequency as the child gets older.

FOOD

In considering the question of the diet one has to think of it from various points of view: (1) efficiency as a nutritive agent; (2) usefulness as an aid to mastication; (3) efficacy as a laxative. All these points are of importance in reference to the well-being of the child. One is apt to think of the matter only from the standpoint of the amount of nutrition obtained. Of course this is the most important factor, but the others are not independent of it. The longer the food is masticated the more it is disintegrated and mixed with the saliva, and the more easily is it digested. Likewise the promotion of a natural action of the bowels, by inducing a healthier condition of mind and body, results in a better absorption of nutrients.

In children, as distinguished from adults, the body tissues have not only to be kept in repair and up to their normal level, and so require food for this, but they also have to increase in size owing to the growth. This implies a relatively greater intake of nourishment, and so the child for his size eats more than an adult. Besides, children lose heat more rapidly than adults, and so require a greater amount of food proportional to their size to make up for this loss.

Atwater calculates that children require a certain proportion of the food required for a man doing moderate work, the proportion depending on their age according to the accompanying table:

A child 3–5	years	needs	·4	food of a man.
" 6–9	"	"	·5	"
" 10–13	"	"	·6	"
A girl 14–16	"	"	·7	"
A boy 14–16	"	"	·8	"

The body tissues consist of proteins, fats, carbohydrates, mineral salts, and water. Consequently in feeding the body all these substances are required in greater or less proportion. The proteins are required for the repairing of tissue waste and for the building of fresh tissue. Fats and carbohydrates are used chiefly as fuel for the production of heat and energy. The function of the salts is still somewhat obscure, but they have much to do with nutrition. They are absorbed chiefly from vegetables and fruits.

Many foods contain all these substances. Often they are rich in one particular only, *e.g.* potatoes and rice are chiefly composed of starch, butter of fat, and fish of protein.

It is most important that the child's diet should be a mixed one, *i.e.* one containing all these alimentary principles, if health is to be maintained. Otherwise disease is liable to arise, *e.g.* rickets develops, owing partly to a deficiency in the amount of fat obtained, scurvy, from a want of fresh vegetables.

Before entering more fully into the different foods which are suitable, it is advisable to consider the subject from the point of view of mastication. Mastication is the grinding of the food between the molar teeth until it has become quite disintegrated. This is a process which is usually ignored, particularly in the case of very young children. Usually children have all their milk teeth by the age of 2½ years, and consequently are able to chew their food quite well, but they do not do so because they have never been brought up to it. Their food from the time it started to become more solid has been of a mushy nature, and has been so broken up for them that there has been no incentive to start chewing it before it is swallowed.

This is a subject which is so important, not only from the point of view of diet, but from that of so many other conditions, such as the healthy state of the teeth themselves, the size of the jaw and the onset of adenoids, that it requires to be particularly emphasized.

It is necessary that, from the start, the child should learn to masticate its food. Otherwise he develops the habit of bolting, and this is difficult to eradicate later on.

The importance of mastication, as far as diet is concerned, is that it causes the food to be thoroughly broken up and mixed with the salivary juice. This juice contains a ferment which converts starch into sugar. This process has to be carried out before any of the starchy food, such as bread, can be absorbed into the system. Not only does the saliva have this action, but it permeates the whole mass in the mouth and promotes the later digestion in the stomach.

Soft, pappy food cannot be masticated. There is nothing there to chew, and so the food slips down too soon. However, we regard certain foods like porridge and milk puddings as so beneficial to children that their soft character has to be overlooked. The starch in them is digested later on, after passing through the stomach. Dr. Sim Wallace says: "The beneficent effects of mastication cannot be got by trying to go through the process if food is not fit for mastication. It is therefore useless to tell people that they must masticate their food without at the same time prescribing food which can be, and in fact requires to be, thoroughly masticated."

Not only does efficient mastication lead to greater digestibility, but it also leads to less food being consumed. Thus there is less waste.

The importance of a regular action of the bowels is so well known, that it needs no further emphasis. In connection with this the diet is of material value. It seems almost unnecessary to state that the contents of the bowel which are evacuated, are the waste products or remains of the food taken, which are not required or have not been utilised for the body's needs. If food is taken in concentrated form, or too refined, there is little left over for excretion. This has a tendency to bring about constipation, owing to the paucity of the contents being insufficient to stimulate the bowel, and thus procure an evacuation. It is advisable that there be a certain amount of undigestible fibre which increases the bulk of the contents. This is obtained in the fibrous tissue which surrounds and encloses the more digestible constituents of vegetables, &c.

Before passing on to consider an average daily dietary, we propose to make a few general remarks on various foods and the best methods of cooking them.

All food should be as pure as possible. No preservatives should be countenanced. Tinned foods are better avoided. Likewise cheap jams.

It is better to give eggs either lightly boiled or poached. Care must be exercised in permitting eggs to be eaten, as they make some children "bilious."

Fish is best steamed. **Meat** should be plainly roasted or boiled. Twice-cooked meat should never be given.

Potatoes should be well cooked, so that there are no hard, indigestible lumps. If cooked in their skins they retain their organic salts. **Vegetables** should be cooked by steam.

Steamed **puddings** are preferable to boiled. Milk puddings, such as rice and sago, are best cooked slowly in the oven for about three hours.

All **fruit** should be fresh and ripe. The skins should be removed. It is advisable to give children raw fruit, such as an apple, to terminate each meal, with the idea of removing any starchy particles of food from the crevices of the teeth. The amount should depend on the individual child. Those children who are inclined to looseness of the bowels may be able to take little or none, while those who have a tendency to constipation may require a considerable amount.

Currants usually pass undigested through the alimentary canal, but in some children they produce irritation, and so it is wiser not to give them.

For **bread** we do not favour wholemeal owing to its coarseness and tendency to irritate. We think it immaterial whether it is brown, standard, or white, but if the last, it should not be made from flour which has been bleached. The chief thing is that the bread should be clean and pure. It should be well done, and the child encouraged to eat the crusty parts. Neither new bread nor hot rolls should be permitted.

Porridge is an admirable food for most children, especially if taken with plenty of milk. It contains a good deal of nitrogenous food, and some fat in addition to its starchy elements. Many children, however, dislike it, and in some cases it has an irritating effect. Scotch oatmeal is the most appetising, but takes a long time to cook. Plasmon oats is much more easily prepared, and possesses greater food value. It is very digestible, and is free from the husks which are so common in many other preparations.

It is better not to give any **raw vegetables** unless it be lettuce or cress. These should always be very carefully washed, as it is supposed that worms often enter the intestinal canal through the eating of insufficiently-washed, raw vegetables.

Condiments are unnecessary, and it is unwise to give them, with the exception of salt, of which a small portion should be given each day with the other food.

Fat of meat is unpalatable to most children, and to force them to eat it in this form is inadvisable. They can get quite enough in more appetising form, *e.g.* dripping, butter, bacon fat, or cream. This last is an excellent and more palatable substitute for cod-liver oil.

Don't give rich or highly-seasoned foods such as pork, game, goose, duck, rich stews or sauces, pickles, spices, highly-flavoured cakes, or pastries.

Sweets should not be debarred altogether, as they permit of the entrance of sugar in a palatable form. However, they should be pure, and free from extraneous colouring matter. They should preferably be of the kind that do not leave much sticky substance clinging to the teeth. It is better not to take them between meals.

Some children may be able to take with impunity what would prove a veritable poison to others, while certain children have their digestive apparatus so delicately balanced that even an apparently harmless food may prove deleterious. Thus experience has to decide on what the individual child should avoid.

The diet should be as varied as possible, as monotony is often conducive to lack of appetite.

Regularity in the hours of meals is very essential, and the times should be kept to punctually.

The following summary gives an idea of the day's diet for a normal child.

Breakfast, 8 A.M.—This should start with porridge or grape nuts and milk, after which a suitable amount of egg, bacon, or fish should be taken, accompanied by bread or toast. Butter is unnecessary with bacon. Warm milk should be given to drink, a breakfast-cupful. It should be taken towards the end of the meal. Tea or coffee should be postponed as long as possible, and when taken should be weak. It is advisable to finish with some raw fruit.

Lunch, 11 A.M.—A glass of warm milk with a well-done plain biscuit or rusk.

Dinner, 1 P.M.—Meat, chicken, or fish, with potatoes. A second vegetable is advisable, *e.g.* cabbage, cauliflower, &c. This should be followed by milk, batter, or lightly-steamed puddings. For older children a little home-made pastry ought not to do any harm. A little fruit and a glass of water should end the meal.

Tea, 4.30 P.M.—This should consist chiefly of bread and butter or toast. If jam or honey is given it should accompany the butter and not replace it. A little plain, preferably home-made, cake may be taken. This meal consists almost entirely of starchy food, which clings to the teeth, so that some fruit should terminate it. Older children, especially after sports or arduous exercises, would benefit by something more substantial in the shape of an egg or some fish, &c. Milk should be the beverage, and should be drunk almost last thing.

Supper.—We advise the taking of a little warm milk and plain biscuit after the bath.

CLOTHING

On no subject dealing with children's physical well-being is there more lack of common sense shown than in the matter of clothing. To get some idea as to the rational lines on which children should be clothed it is necessary to understand the functions of the skin. The skin, besides getting rid of waste products of the body in the form of sweat, has one other supreme function, viz. the regulation of the body temperature. This has to be maintained about a certain level. This temperature is the result of chemical changes going on throughout the body. These changes are produced by the assimilation and combustion of food in the tissues. If there is a deficiency in the amount of food, it is made up by calling on the body tissue itself to supply the want, and thus enable a requisite amount of heat to be generated. To prevent this production of heat from becoming too great, heat is lost from the surface of the body partly by conduction into surrounding objects in contact with it, partly by radiation into the air, but chiefly by evaporation of the sweat.

Air is a bad conductor of heat; it does not take it up readily from the body. But water is a good conductor, and so on a damp day, when the air is heavily charged with moisture, the water in the atmosphere would abstract a considerable amount of heat from the naked body. When a cold object comes in contact with a warm one there is always a tendency for the two to impart to each other their respective qualities of cold and heat until they have reached the same temperature. Thus on a cold day, and particularly a damp one, there would be a great loss of heat from the exposed skin. To maintain the body temperature in such circumstances there must be either an increase in fuel in the form of food to make good the loss, or there must be a diminution of the loss of heat. Clothes are consequently worn to prevent this undue loss. By this means we ensure a temperature of air in contact with the skin, which is considerably higher than that of the outside air. Besides, clothing prevents the wind from blowing over the body surface, and increasing the amount of evaporation, which would lead to undue cooling.

Having outlined the reasons for wearing clothing, we come next to the question of the nature and amount.

In determining what material the garments should consist of, we have to bear in mind that the function of clothing is to prevent undue loss of heat. Therefore a substance which is a bad conductor of heat should be chosen.

Underclothing is made of wool, silk, cotton, and linen, and in deciding which of these is the best we have to inquire into their respective properties. Silk is too expensive a material for any but the select few, so we do not consider it further.

Wool is a bad conductor of heat, *i.e.* it does not convey it away readily. It absorbs moisture readily, the water penetrating into the fibres and distending them. In these respects it is much superior to either cotton or linen, its power of absorption being at least double in proportion to its weight and quadruple in proportion to its surface. This absorptive power seems to vary considerably, at least as far as rapidity is concerned, depending on the quality of the wool and the way it is woven. The best quality, woven in the style for combinations, absorbs water most readily. Good flannel does not appear to take it up quite so quickly, although this is much more absorbent than the coarser wool of cheap combinations. The water evaporates slowly from wool, and so lessens any risk of a chill. The disadvantage lies in the fact that washing usually renders the fibre smaller, harder, and less absorbent owing to its shrinkage. This can be avoided by washing the garments carefully.

Both cotton and linen are good conductors of heat, especially the latter, and more particularly so when they are woven closely, as in the case, *e.g.*, of chemises. The garments readily become damp with the sweat, and cling to the body. Evaporation proceeds quickly, and is apt to produce a good deal of surface chilling. If they are so woven that their fibres enclose a considerable amount of air in the interstices of the garment there is a much smaller loss of heat, owing to air being a bad conductor. These loosely-woven garments, especially cotton, absorb moisture freely, almost as much as a closely-woven woollen fabric. Aertex cellular and Empire linen mesh furnish examples of the only way in which cotton or linen clothing should be worn next to the skin.

The question as to whether wool or other material should be used for underclothing creates much diversity of opinion. There are those who assert that wool should never be worn next to the skin because it is non-absorbent and so will not take up the sweat, but this is contrary to fact. It does absorb moisture readily, and further it does not feel damp when it has absorbed moisture, and it does not create a chilly feeling from evaporation. These authorities advocate cotton, and more particularly linen woven in a special manner. These, they assert correctly, are highly absorbent, but the material, especially linen, is a good conductor of heat, and even when woven so that the fibre is broken up with numerous air spaces, it still takes away a good deal of heat from the body, and produces a feeling of cold. This, especially in winter, is one of its great drawbacks. Further, if much sweating ensues the garment becomes damp and feels damp, and evaporation takes place more readily from it than is the case with woollen material, with consequent liability to the development of chill after extra exertion.

We are of opinion that for this country woollen fabrics are the best all-round underclothing during the colder months. However, robust children, and those who benefit by a daily cold bath all the year round, may possibly find cotton or linen mesh garments quite satisfactory, but we do not think they should ever be worn by delicate children, those with poor circulation, or those with neurotic or rheumatic constitutions.

In summer if wool is worn the garment should be very thin, but we regard cotton or linen mesh garments as probably more suitable; for they permit of freer evaporation of sweat, which is often necessary in the hot weather, and woollen material in such cases tends to prevent a sufficient loss of heat owing to evaporation taking place less readily.

The amount should be sufficient to prevent any undue sensation of cold. This will vary with the state of the weather, and also with the physique of the individual child.

For late autumn, winter, and spring, girls should be clothed as follows:

For indoor wear, long-sleeved woollen combinations, woollen knickers that can be washed, supported by a bodice made of wool, a skirt unlined and not too heavy, with a thin bodice, and a loose woollen jersey; long woollen stockings coming well above the knee, and shoes. Older girls should wear a serge dress, or thick blouse and skirt.

For outdoor wear they should have a lined serge or woollen coat, stout shoes, a hat, and woollen gloves. In wet weather goloshes are advisable, and when the weather is very severe a Shetland spencer should be worn under the coat.

Boys should wear indoors, long-sleeved woollen combinations or a vest and pants, a flannel shirt, woollen knickers supported by a cotton waistcoat buttoning at the back, and a loose woollen jersey. For older boys a Norfolk suit is advisable. Long woollen stockings and shoes should complete the clothing.

For outdoor wear they should have a woollen overcoat, which should not be too heavy and should button well up to the neck, stout shoes, a cap, and woollen gloves. If necessary, goloshes should be used.

In summer girls should wear aertex cellular cotton combinations, thin washing knickers with a woollen bodice, a thin petticoat, and a light dress.

Boys should wear similar combinations or vest and pants, a thin shirt, and a light suit.

Robust children may possibly suffer no harm from wearing less clothing than the above, but the idea that you can harden a child by accustoming him from early days to wear an inadequate amount of clothing is as erroneous as it is often calamitous. We wish to emphasize this point. Where children can with impunity stand the vagaries of our climate with less than the average amount of clothing, they do so because they are robust, not because they have been hardened to it.

The underclothing should be changed at least once a week.

All clothes should be loose. There should be no tight armholes, neck-bands, or tight elastic round the knickers. Red-riding-hood cloaks and similar garments should be particularly avoided, as their weight drags on the neck too much.

Stockings.—These should conform to the shape of the foot and not be pointed. They should be neither too big nor too small. Too many darns often give rise to sore feet. Suspenders should be used to support them instead of garters, as the latter tend to constrict the circulation.

Shoes.—These should have thick soles. The heels should not be high or tapering but low and broad. The shape should conform to that of the natural foot, being wide at the toes and having the inner edge straight or slightly curved inwards. The upper leather should be soft and pliable. Shoes should not be too heavy. They are preferable to boots because they give greater freedom to the ankle. There should be separate shoes of a lighter make for indoors. It is advisable to have two pairs of outdoor shoes in constant use, in case one pair gets damp.

Gloves.—These should be woollen and not tight. Kid gloves are inadvisable.

Hats.—It is bad to wear heavy hats. In summer they should have broad brims to shield from the glare of the sun, and to protect the back of the neck. It is important to avoid tight elastic. For boys a cap in winter and a straw hat in summer are the only kinds suitable. Bowlers and top hats should not be worn.

Mackintoshes are not suitable because they prevent evaporation of the sweat. Coats made of rainproof material such as Burberry's should be used instead.

Night Clothes.—None of the same clothes should be worn day and night.

In winter a flannel nightgown, sleeping suit, or pyjamas should be worn. Young children in addition should wear a woollen vest, because they so often throw the clothes off.

In summer a cotton nightgown with a vest underneath, or thin pyjamas.

Bedroom slippers and a dressing-gown should be handy, in case they are required during the night. This prevents any risk of a chill.

Bed Clothes.—It is best to sleep on a blanket as long as possible. One or two blankets on top in summer, and two or three in winter. A sheet should protect the skin of the face and neck from the top blanket. The practice of using an eiderdown we regard as indefensible, owing to the way in which it prevents evaporation of the perspiration and so causes a moisture all over the skin.

Having indicated what seems to us to be a rational idea in clothing a child, we wish to make some remarks on the harm which results from the way large numbers of children are clad.

Many people pile numerous garments on their children, especially over the trunk of the body. Little girls particularly suffer from this suffocation of the skin. It is no uncommon thing to come across eight or nine or even more thicknesses. Usually, though the body is groaning under this weight, the limbs are almost if not quite bare. The result is that the child sweats easily and is then liable to contract a chill. Most people seem to regard the clothing of the limbs as of little or no importance, and in consequence it is a matter of everyday experience to come across large numbers of children who are continual martyrs to catarrh. Not only is the distribution of the clothing at fault, but many of the garments are fertile sources of future deformity; *e.g.* the stays which are so commonly worn by little girls. It is a very rare occurrence to come across any which are other than stiff or quilted: their shape is all wrong, being far too narrow in the front, and the consequence is that the child becomes round-shouldered to ease off the pressure on the front wall of the chest. Not only do they cause this deformity, but they impede the breathing, and prevent a proper expansion of the lungs. The corset, too, with its stiff busks, which is so commonly met with among girls of eleven and upwards, is quite an unnecessary garment. Not only does it cramp the girl's frame, but it hampers her movements and interferes with her drill exercises.

In passing we would just refer to the fallacy which is so commonly believed in, that the use of shoulder-straps attached to the stays will have a very beneficial effect in getting rid of a round-shouldered condition. To be of any use they must be pulled so tight that breathing is difficult.

The chest protector is another garment which does more harm than good. As often as not it clothes the front only, and is often crumpled up and twisted into a string. It is usually made of some quilted material, which is mostly impervious to the perspiration, and commonly it is so saturated with oil that it acts as a continual poultice.

It will be obvious to anyone who has grasped the principles enunciated above that garments which become damp should be changed at once.

With regard to changing clothes, many people, regardless of the state of the weather, put a child into thinner or thicker clothing as the case may be, as soon as a certain date has been reached. This of course is an absurd practice, and should never be adopted. It is wiser to err on the side of wearing thicker clothing for a little longer than is necessary than risk changing too soon.

Before leaving this subject we would just mention that when we write about suitable clothing for summer, we refer to warm summer weather. If the days are cold thicker clothing should be worn.

REST

Every form of life exhibits periods of repose alternating with times of activity. The rest is a necessity to enable the organism to recuperate from the energy expended in work. In the young the active spell is only a short one, and must be succeeded by a state of passivity. Thus children require frequent opportunities of rest during the day. The younger the child the more often does he require a time of repose. By rest we do not necessarily mean only inactivity. Change of occupation may enable one part of the body to obtain quiet while another is being used; *e.g.* after a lesson in arithmetic, in which the brain has been very active, the performance of physical exercise, though not constituting rest in the everyday acceptation of the term, really gives repose to the brain by changing the attention to something else.

Young children are not able to maintain much attention to any subject after about 20 minutes. They require a change of occupation, and thus all lessons for little children have to be short. As the child becomes older the capacity for concentration on a subject becomes greater, but 40 minutes is about the longest time that should be devoted to any lesson. This subject is further dealt with in connection with education and over-pressure.

At night time the whole of the body seeks repose, and it takes up the recumbent position. This relieves most of the muscles and gives the heart less work to do.

In sleep the brain becomes relatively anæmic and inactive, the heart is slowed, the blood pressure falls, and the breathing becomes shallower.

There are variations in the soundness of sleep, not only in different individuals, but also in each person during the night. Experiments carried out show that for normal people sleep becomes deepest at the end of the first hour, when it is dreamless. At the end of the second hour it has become shallower. From this time onward until the fourth hour it gets deeper again, after which it becomes lighter till the person wakes up. Dreaming takes place during the periods when sleep is shallower, for then the brain is more active. This is the normal curve of sleep, but variations are met with in certain circumstances, *e.g.* as a result of overstudy, the period when sleep is soundest may be delayed till the second or third hour; while, in consequence of dietetic errors, especially in children, the first deep sleep rapidly gives place to shallow sleep and dreaming. This is particularly the case in highly-strung children, and explains why it is so common to get night terrors developing in the early part of the night. The amount of sleep required varies much, according to the age and also the disposition and temperament of the child.

Still one may lay down certain rules which it is advisable to pay attention to. Dr. Clement Dukes, from his experience in the matter of sleep for the young, suggests the hours as set out in the accompanying table:

Age.	Number of Hours.	Time.
Under 6 years	13	6 p.m. to 7 a.m.
7 ,,	12½	6.30 p.m. to 7 a.m.
8 ,,	12	7 p.m. to 7 a.m.
9 ,,	11½	7.30 p.m. to 7 a.m.
10 ,,	11	8 p.m. to 7 a.m.
13 ,,	10½	8.30 p.m. to 7 a.m.
15 ,,	10	9 p.m. to 7 a.m.

Extend in winter to 7.30 a.m.

This is a counsel of perfection which probably few in this strenuous world are likely to attain to, especially in the later years. Most authorities, however, are agreed that from 13 to 16 years there should be a minimum of 9 hours in summer and 9½ hours in winter.

Our own investigation into the question as regards the effect of the amount of sleep on the height and weight of the growing boy of 13 years old is seen in the following table:

	Numbers.	Height in Inches.	Weight in Lbs.	Numbers.	3 years Increment in Inches.	3 years Increment in Lbs.
8 to 9 hours	100	55·9	77·8	61	4·9	18·8
9 to 10 hours	240	56·9	80	149	5·3	20·4
10 to 11 hours	296	57·4	80·9	176	5·7	21·1
11 to 12 hours	63	57·9	82·6	37	5·8	20·8

The child ought to be trained from his earliest days to go to sleep in the dark without anyone being present. But if he is of such a highly-strung temperament that the darkness terrifies him, only harm can come from attempting to enforce such a regulation. For such children there should always be a night light.

For some time before the child goes to bed there should be a preparation for repose by the avoidance of any form of excitement. There is a much greater likelihood of his falling quickly into a tranquil sleep, if such be observed. In this connection we would point out that the activity of the brain which results from the doing of home work up to late hours is a common cause of sleeplessness. Especially is this the case with arithmetic and similar subjects; so that, if these are set, they should be done early in the evening, leaving the lighter tasks for the last. It is desirable that an interval for light recreation should precede the retirement, in the case of all who use their brain much at night time.

Sleeplessness is a cause of much trouble. It may often be removed by such simple remedies as a hot bath, a drink of hot milk, or the warming of the bed by means of a hot-water bottle. Many children suffer from cold feet, and nothing is more calculated to keep a child awake and restless than this. In such cases bed-socks should be worn, and a hot bottle used if necessary.

It is a wise plan in the older child to try and develop the power of complete muscular relaxation. It is a habit which ought to be acquired by everyone. If carried out it would prevent a great deal of the nervous overstrain so characteristic of the day.

Ordinarily, when anyone is standing or sitting, a large number of muscles in the body are more or less on the strain, which means that nervous impulses are going down to them to maintain them in this attitude; so that, if one can relax these muscles, there is so much less nervous energy used up. In order to carry out this plan a person should lean backwards in a comfortable chair or sofa, and try to let the limbs become quite flaccid, so that should they be moved, on being let go they would immediately fall like a dead weight. This condition of relaxation can readily be acquired by perseverance. The effect is very recuperating.

In order to ensure sound sleep, a quiet room is preferable, although most people can soon become accustomed to sleeping with a noise going on. The room should be plainly furnished, and should contain a minimum of furniture. Most bedrooms are apt to be too crowded with furniture and trimmings. These very materially diminish the cubic air space available. The wallpaper should be light, and free from any aggressive colouring.

The mattress should be firm, preferably of horsehair. A feather bed should never be allowed. The pillow should be low. The bedclothes should be ample but not excessive. To a certain extent the amount varies with the individual child, some requiring more coverings than others.

There should be plenty of fresh air, and to obtain this it is most important to have the windows open. Many people think it sufficient if the door is left open, but the air which enters thus is not fresh; it is usually drawn from the downstairs rooms, where it has been previously vitiated. Opening the window about 1 inch is not enough. There is absolutely no reason why the window should not be drawn down for a foot or more. The important point to bear in mind is that a direct draught on to the child should be avoided. This can usually be arranged by changing the position of the bed or fixing up a screen.

EXERCISE

The question of exercise is almost as important as that of sleep. Both are necessary to the healthy child; in fact, one succeeds the other automatically. Exercise is the expression of the vitality of the child, and it is as natural for the young to run, jump, or shout as it is to require rest. The exuberance of the child's nature shows itself in this way. A child who does not exhibit this energy is usually ill. These ebullitions come on suddenly and soon die down, as they cannot be maintained for long. Now this being the case, it is extremely important for the fact to be recognised in school. There is not sufficient opportunity for a free display of animal spirits during the school work. Every lesson should be succeeded by a short period of play or physical exercise. We feel sure that better results would be obtained in school work if more attention were paid to this matter. As a matter of practical experience, in some schools in Switzerland, which have adopted such a system, increased attention and energy has been the result.

Exercises may be regarded from two points of view: (*a*) educational, (*b*) physical. In the case of the former the object to be attained is so to develop the mind and brain that the scholar is more alert and quick to respond to directions, better able to concentrate his attention and control his actions, and more resolute in his demeanour. In the case of the latter the exercises are directed towards promoting physical well-being by enlarging the capacity of the chest, stimulating the respiration and circulation, and thus improving the nutrition of the body besides increasing the tone of the muscles.

They may be directed towards maintaining a healthy condition of the body, or they may aim at the correction of some deformity. Any kind of exercise which brings into play the contraction of a number of muscles produces this "nutritive" action. Thus walking, running, jumping, or skipping all have this effect. All these movements are automatic to the child, although at the start they had to be learnt by degrees. To be of educational value there must always be something new to learn, some new way of doing a thing which keeps the mind alert and active until it has been learnt, when the action becomes again largely automatic. These actions may be made educative by showing the correct way of getting the best results with the least expenditure of energy, *e.g.* many children do not know how to run properly, but can be trained to do so. Where exercises are required as interludes between lessons, they should be such as do not require much concentration, just enough to perform them properly. Thus they should consist of simple exercises, bringing into play as large a number of muscles as possible.

In correcting deformities of the body the quality of the contraction of the muscles has a much more beneficial effect than the quantity. The child should put his whole soul into the task, for it is imperative in this case that the mind be on the alert to ensure the maintenance of a correct posture, and the concentration required to perform the duties thoroughly hastens the disappearance of the defect. The Superintendents of Physical Training of the School Board of Glasgow in their recent handbook state that "the attainment of correct movement is of greater value than promptitude and unison. Promptitude, unison, and polish will be the fruits of steady good practice and discipline."

To be of real value the exercises should be carried out daily. It is important to note that at the commencement the child should be in a correct position, otherwise exercises may tend to accentuate any deformity.

Such exercises as have been referred to here are detailed in the Syllabus for Physical Exercises published by the Board of Education. These are particularly of use where it is impossible to get exercise in other ways, but where possible every encouragement should be given to the adoption of games. Thus, in girls' schools, such games as net-ball, tennis, or hockey should be adopted. Boys in addition should have football or sports, &c. wherever possible. Swimming is an excellent form of exercise, for it brings into play nearly all the muscles of the body. We would only point out that many children are not able to stay in the water long enough to enable them to gain much benefit from this particular form of exercise. Especially is this the case where the water is not warmed. Rowing also exercises a large number of muscles, and is to be commended for older boys and girls.

It is important in connection with hard games like football and hockey to remember that young boys and girls are not able to play them for long, as their muscular energy is soon used up, and it is bad for them to try to play after they are fatigued. Older children are able by training to increase their staying power considerably. Mr. C. Roberts points out that children under 12 or 13 cannot be trained like older boys either for athletic sports or severe gymnastic exercises. "Football, cricket, and athletic contests, &c. do not meet the requirements of young children. Football soon exhausts young children, and is too violent while it lasts to be of permanent advantage. The same objection applies to all forms of violent exercise in the gymnasium or elsewhere; hence small children enjoy playing games, and are more benefited by them than by athletics or gymnastics with apparatus. There are, however, many gymnastic exercises with light dumb-bells, bars, and clubs suitable for young children of both sexes, and they are frequently taught in schools."

Scouting is a very popular form, in which much beneficial exercise may be obtained. But it is unsuitable for young children, and as carried out is very bad for older boys, owing to the long marches, &c. which are undertaken. It is unfortunate that scoutmasters often set the pace according to the capacity of the bigger and more robust boys, with the result that the weaker boys suffer harm. Long marches are not good for boys, and tend to induce a dilatation of the heart owing to muscular fatigue. We feel quite sure that much better results would arise from this enterprise if there were separate sections for younger and older boys.

Gymnastics has a tendency to unduly exercise the arms as compared with the legs. For the robuster boys it is an excellent means of training, but requires to be supplemented by games of some sort. Dancing is a form of exercise which is eminently suitable for girls. It produces a grace of movement which is obtained by no other form of physical training. All children should receive lessons in this subject, for it brings into play most of the muscles, and creates a suppleness of movement which is eminently desirable. The recrudescence of the old folk, &c., dances has done much to popularise this form of physical education.

For very young children kindergarten games and dancing are the chief forms of exercise which should be considered. These should be so arranged that as many muscles as possible are brought into action. Set exercises in the form of Swedish or any other form of drill should not be permitted in infants' departments. The only form of exercises allowed should be marching and breathing exercises. These carried out to the rhythm of music make them less tedious to the young child.

It is important to observe certain rules with regard to exercise. The clothing should not be tight so that the movements of the limbs or chest are restricted. The boots should permit of flexibility of the foot.

A short time should elapse after a meal before carrying out any of the more active exercises.

It is preferable that they should be carried on out of doors.

When heated after exertion, care should be taken to avoid a chill.

Exemptions from Physical Exercises.—All children are not able to carry out or derive benefit from drill or games, &c. Some should only take part in certain of the exercises, *e.g.* if a child, who is not over robust, has a long walk to school he has already had a good deal of leg movements, and consequently his drill should consist mostly of arm movements and breathing properly. Children who suffer from heart disease usually find a full drill too trying. In many of these cases it may be necessary to interdict all forms of drill or games, at any rate for the time being. But sometimes it is only necessary to curtail some of the more violent or exhausting movements, such as lunging or arms upward stretch. The same holds true in marked cases of anæmia. Slighter degrees of anæmia derive much benefit from a mitigated form of drill.

All children convalescing from illness should have the exercises restricted to the simplest and those most easily performed. They should not be subjected to much strain until they have regained some of their former vigour.

Malnutrition, especially if it is due to insufficiency of food or disease, is another condition which should entail a very easy lesson, and possibly in some cases a stoppage of exercises altogether. It is useless trying to increase the capacity of the body for food, if there is not enough to supply what is already needed.

Where a child has hernia there should be no form of exercise which entails a strain on the abdominal muscles. This interdict also applies to children who have had an abdominal operation, and should last until the scar has become much firmer, about a year after the operation.

CLIMATE

Under this heading we propose to make a few remarks on the subject of health, from the point of view of the effect of climatic conditions upon it.

Climate is a comprehensive term, which embraces a number of different factors. All these together produce a certain "atmosphere," which we term the climate of a place. To understand something of the effect of climate we must have some idea of the various conditions comprising that state.

In taking into consideration the climate of a place, then, we pay regard in the first place to its exposure, *i.e.* whether it is exposed to or protected from the cold winds, whether it is open to or hidden from the sun, and whether there is an extensive area of water in the neighbourhood. There is also the elevation of a place to be considered, its height above sea-level; for the higher the altitude the purer the air, the less its density and moisture, and the greater the daily ranges of temperature. These conditions produce a general stimulation of the whole body, the pulse and respiration are quicker, the body more active, and the faculties keener.

The subsoil too plays its part, for where water is stagnant, whether because the place is low-lying or there is an impermeable layer of soil such as clay which prevents it draining away, there is a dampness about the atmosphere which has a chilling effect in the colder weather.

Other factors included under the term Meteorology also play a considerable part. Meteorology is the science of the weather, and includes the amount of sunshine, rainfall, wind, temperature, and humidity. The sun warms the earth and this warms the air. It also purifies the air because its rays have a germicidal action. It stimulates the skin and generally promotes the well-being of the body, partly through its physical and partly through its psychical effect.

Wind is movement of the air. It is produced because warm air always rises and cold air rushes in to take its place. In this country winds from the south-west are relatively laden with moisture through passing over the Atlantic ocean. This makes them milder than those from the north and east, which are dryer and colder, and consequently more stimulating.

Rainfall varies very much in places even in this country. The presence of mountains determines it, and the mountainous regions on the west coast experience a much greater rainfall than elsewhere, owing to the moisture-laden south-west winds coming in contact with the cold mountain summits. As cold air cannot contain as much moisture as warm, the excess is deposited as rain. The average for England and Wales is 35 inches per annum, and varies from 50 to 100 inches on the west coast to 10 to 20 on the east coast.

Humidity is the amount of moisture in the air. Absolute humidity is the total weight of water vapour in a certain volume of air. Relative humidity is the percentage of moisture in the air compared to what there would be if it were saturated. The most agreeable amount of relative humidity is 70 to 80 per cent. If this is less, more aqueous vapour is taken up from our bodies. If the amount is high there is an insufficient removal of vapour from our bodies. This explains the oppressive feeling which we experience on a damp, hot day.

Where the relative humidity is high, it means that there is a comparatively large amount of moisture in the air, and this tends to prevent heat escaping from the earth. It thus serves to make the temperature more equable. When the temperature falls the air soon becomes saturated with moisture, for the colder the air the less moisture can it contain. Thus, mists develop readily where the humidity is high. Where it is low there is less tendency to fog and there are considerable variations in temperature.

Temperature is the amount of heat which the air contains. It varies with and is dependent on most of the other factors mentioned. None of these factors are independent. They each to a certain extent exercise an influence on the others.

In this country we have considerable variations in climate. On the south-west coast the atmosphere is milder and the temperature more equable, owing to the greater degree of moisture in the air and to its southerly aspect. The north and east coast is more stimulating and invigorating, owing to the greater ranges of temperature. Speaking generally, one may say that a low-lying place, a sheltered spot, or a place where the humidity is high and there is little liability to extremes in temperature, will have a sedative, or as it is often termed, relaxing effect on the system. On the other hand an elevated spot, an exposed place, or one that is dry and in consequence subject to great variations in temperature, will exercise a bracing or stimulating action.

The physiological effects on the body produced by these differences in climate vary accordingly. Thus a bracing climate stimulates the functions of all the organs of the body, the appetite is sharpened, the circulation is quickened, the mind and body become more energetic, and the whole process between the intake of food and the output of energy is increased.

A relaxing climate produces the opposite effect. There is a relative inertia of mind and body, the appetite is lessened, and the whole process of metabolism diminished.

Now these tonic and sedative effects of climate have an important practical bearing on the welfare of child life, more particularly where the child is suffering from some indefinite ailment.

Some children are sluggish in temperament, some are rather anæmic, some are convalescing from an illness, others may have that constitution which is spoken of as "having a tendency to consumption." These lethargic individuals want energising. Their vitality is low and requires rousing. They have been meandering through life and want speeding up. A tonic, bracing climate is just what they need, and by going to one for a month or so they are driven at higher pressure and improve accordingly.

On the other hand, there are numbers of children who are excitable, hysterical, perhaps epileptic, others with heart disease. In these there is too much wear and tear, and the machine wants to go slow. They want, for the time being at any rate, a more somnolent existence, and so a sedative climate with its quietening influence should be sought out for them.

In connection with the annual holiday these facts should be borne in mind. Where people live in relaxing places they should get away to a bracing air, so that their whole organism may be driven at greater pressure, and they may become enlivened and toned up. On the other hand, those who live in a stimulating climate should seek a change to a sleepy place, so that they may have a rest from their excessive energy. They should do this rather than seek a still more bracing climate. On their return they will get the stimulating effect, and feel all the better for the slower pace.

These remarks apply particularly to children.

A consideration of the foregoing statements, in reference to individual children may enable parents, by timely change of air, to prevent a good deal of ill-health or disease from arising or progressing.

SPECIAL HYGIENE.—NOSE

The nose, besides being an organ for perceiving sensations which we term smell, acts as a filter for catching dust and germs, and thus prevents them entering into the lungs, &c. It also permits of the air being warmed and moistened before its entry into the lower respiratory apparatus.

In consequence of these functions it will be realised how important it is for the child at a very early age to learn how to breathe properly, in and out through the nose. He should also be taught how to blow his nose, and thus keep the passages fairly clear. He should never be allowed to poke his finger up or pick at his nose, in case of injuring the delicate lining membrane.

The frequency of obstruction to free breathing through the nose is so marked nowadays, and the consequences may prove so deleterious to the child's welfare, that the necessity for paying attention to such a matter must be apparent to everyone.

This difficulty in nasal breathing may be due to a variety of different causes such as post-nasal adenoids, chronic catarrh, enlargement of the bones in the nose, &c. The object is to try and prevent these conditions arising, and much may be done with this end in view.

Adenoids.—This is one of the commonest causes of obstruction to breathing, and is one which is very amenable to treatment, especially so in the early stages. The condition may be the cause of so much suffering to the child through causing deafness and stupidity, besides disease of the ear, &c., that it is particularly desirable to aim at preventing its development, and if it is present hastening its removal.

At the outset it is as well to state that adenoids is merely a term used to describe an overgrowth of a tissue which is normally present in every child. This substance is found at the back part of the mouth, just behind the nose. To prevent its overgrowth the early adoption of a correct method of breathing is essential, as the constant passage of air to and fro over the mucous membrane prevents its increase. This proper breathing also diminishes the risk of the child catching cold and so developing a catarrh of the nose. The irritation produced by the discharge from a chronic cold in the head is not an uncommon cause of the development of adenoids. Thus every care should be taken to avoid a cold, and so attention to the clothing and diet are of importance. The early development of efficient mastication also becomes of moment in this connection, because a neglect of this tends to the development of a high, arched, narrow palate. This in turn leads to a certain amount of nasal obstruction, and in consequence there is a greater tendency for adenoids to arise.

We feel absolutely sure from the experience of hundreds of children with adenoids, that, in the majority of cases the condition could be prevented, and when it does occur, that it can be cured by the simple exercises which are given.

These exercises should be carried out under the supervision of some older person, to ensure their being properly performed. They should take place at home, preferably in the open air, as well as at school. A few minutes devoted to these exercises three times a day will produce striking results, where they are carried out properly. The child should stand firmly on his legs with the shoulders well back and the mouth firmly shut. First the right nostril should be closed with the finger, then a deep breath should be taken through the left nostril, and the expiration should also come down the same channel. This process should be repeated several times, after which the sides should be reversed. Finally both nostrils should be kept open, and the same proceeding carried out.

Chronic Discharge.—This may be just a thin, watery secretion, or it may be thicker, and sometimes is purulent and offensive. The discharge may be due to a variety of causes, *e.g.* the presence of a foreign body, such as a pea or boot-button, or ulceration, &c. It is advisable at an early stage in a persistent trouble like this to obtain further advice from a doctor, as neglect of this may lead to more serious developments later on.

MOUTH

Probably there is no trouble which is more common than an unclean mouth. This may show itself in the presence of little ulcers on the inside of the cheeks or elsewhere. These usually occur in unhealthy, underfed children, and one of the first aids to their removal is to improve the general tone of the child by feeding up, &c. The use of an antiseptic mouth-wash tends to hasten the cure.

The gums are often spongy and inflamed, and bleed easily at the least touch, and the breath is very foul. This condition usually occurs when the child is in poor health, and the mouth has been neglected. It often starts through food collecting at the junction of the tooth and gums. This ferments, and germs growing in it give rise to inflammation of the gums. The use of an antiseptic mouth-wash is necessary, and a stick with a cotton-wool mop at the end, to cleanse the junctions of teeth and gums properly. The toothbrush is too hard, and causes bleeding, and thus tends to accentuate the trouble.

Teeth.—There is no disease which is so universal as, or which causes more ill-health than, decay of the teeth. The condition is produced in the first place by the accumulation of starchy food in the crevices and irregularities of the teeth. This accumulation, through the action of germs, undergoes an acid fermentation. In course of time this acid dissolves out the lime salts from the teeth, and leaves a soft, gelatinous structure behind, which acts as an excellent bed for the growth of the germs. This process gradually continues until the tooth is eaten through, and the decay reaches the dental pulp, whence it spreads rapidly into the underlying gum substance, and eventually results in the development of an abscess in the gum. This is a brief description of the history of the decay in a tooth. It may take a longer or shorter time, depending on the strength of the teeth and the quality of the enamel.

When one considers the enormous amount of dental decay which exists among children at the present time, and the fact that among primitive races and in ancient man the teeth are in a remarkably healthy condition, one cannot but be driven to the conclusion that the causes of this disease are to be found in the conditions of civilised life. The quality and character of the food is the chief condition which determines this difference. The diet of primitive man consisted largely of animal or vegetable food in a more or less coarse condition, with plenty of fibre and toughness, requiring a considerable amount of mastication before it could be swallowed. This coarse food kept any starchy particles from remaining in contact with the teeth. Present-day cooking has as one of its objects the elimination of toughness from meat and fibre from vegetable foods, with the result that there is little in the food to act as a cleanser, and what little there is is quickly hurried on, owing to the ease with which it can be swallowed. This subject is further considered in the section on diet.

Wild animals do not suffer from dental caries, nor do domestic pets when they are allowed to gnaw, but those, which are fed on pappy food only, do develop decay.

Most children at the outset have a good set of teeth, and if their diet is modified somewhat from the usually accepted standards, they are starting on the right way to prevent decay arising. Thus no meal should finish up with pappy food like white bread or puddings; there should always be something harder to chew, like a dry crust or a raw apple. Finally the mouth should be swilled out with water.

The use of a toothbrush in addition is an added precaution. The brush should have fairly stiff bristles, preferably cut to the contour of the teeth.

The teeth should be cleansed after every meal, and particularly at night-time after supper, for most harm is done when food remains in contact with the teeth all night.

The edges and crowns of the teeth should receive attention, as well as the sides, both inside and outside. The brush should pass from the gum towards the edge of the teeth with a rotatory action, to facilitate removal of particles from between the teeth. A bland powder like precipitated chalk may be used, but is not necessary. It is important that a gritty powder be not used, as it tends to wear off the enamel.

More fibrous food is important, because it necessitates mastication before it can be swallowed, and thus not only prevents decay, but increases the size of the jaw and the strength of the teeth. The increase in the size of the jaw also prevents the crowding of the permanent teeth, and in this way too there is an improvement.

There has been a great outcry against the use of sweets, as being particularly harmful in causing dental caries. There is no doubt that they may be a fertile cause of this condition, particularly the soft sticky kinds, but if precautions are taken to chew some cleansing agent afterwards, there is no occasion to deprive children of what is a natural craving for sugar in this particularly palatable form.

The use of an antiseptic dentifrice is an excellent thing as a toilet requisite, but it has little effect in reducing the multitude of germs which inhabit the mouth.

In the prevention of dental disease, then, there are three main lines of defensive action.

1. The adoption of a proper diet from the earliest age, this demanding the practice of mastication.
2. Cleanliness in the form of washing out the mouth and brushing the teeth.
3. The systematic inspection of the teeth by a competent dentist, and the early treatment of decay.

The two first aim directly at preventing disease arising, the last acts indirectly in this way, by getting at the teeth in the earliest stage of the decay and filling them, so that the disease ceases to spread.

The teeth should be examined at least once a year. It is particularly important that this should be done regularly from the age of 6 years, when the permanent teeth usually begin to emerge.

THROAT

Enlarged tonsils are extremely common in children, and although in the majority of cases they give rise to little or no inconvenience, there is always the fact that they are potential sources of trouble. It is commonly regarded nowadays that they are the seat of entry of many diseases, such as scarlet fever, rheumatic fever, &c.

One of the causes of this enlargement is undoubtedly the presence of a number of decayed teeth. Mouth breathing is another, also frequent colds.

The line of prevention is obvious. To keep the throat healthy the child should have a clean mouth and a clean nose.

The tonsils are often the seat of inflammatory processes, which may result in the formation of an abscess. An unhealthy condition of the tonsils is one of the causes which prevents a discharging ear from healing.

Where a child is constantly having sore throats it is advisable to seek medical advice for the condition.

EAR

Not only may a child suffer physically from a diseased ear, but the interference with hearing which so commonly ensues, causes the child to lead a hampered life. He is unable to appreciate the finer degrees of sound, and if the defect is more marked there is a stunting of intellect. Consequently the maintenance of a healthy condition of this organ is of great importance in considering the child's welfare.

The ear is an external appendage which enables sound to be collected more easily and transmitted down the auditory canal to the drum. The walls of this canal contain certain glands which secrete a sticky substance called wax. This is for the purpose of preventing dust or other foreign matter from penetrating down to the drum. Often there is a tendency for this wax to accumulate to such an extent that with the extraneous matter it forms a hard pellet, which may press on the drum and thus give rise to pain or cause deafness. This requires to be removed, but it must first be softened by the instillation of a few drops of warmed sweet oil or glycerine and water a night or two previous to syringing with warm water. A quicker method of loosening the wax and facilitating its removal is to insert a few drops of a weak solution of peroxide of hydrogen and then syringe the ear after the lapse of a few minutes. Great care is necessary in syringing the ear to avoid damaging the drum.

The wax should never be removed from a child's ear by means of a pin or hairpin, as is so often done, as the drum may be easily injured thereby.

The wax is a normal secretion, which is there for a definite purpose, and which it is unnecessary to remove unless it becomes caked. In fact the continual removal may be attended with unfortunate results in these days of motors with so much fine dust raised. Only that, which can be easily reached with a towel after washing, should be got rid of. It is not an uncommon thing for young children to put things in their ears, such as beads, boot-buttons, or peas, &c. It is always advisable in such cases to obtain medical advice, as an awkward attempt at removal may result in permanent damage to the drum. In the case of peas or beans a syringe should never be used, as if the foreign body is not removed it swells up with the moisture and becomes more impacted than ever.

Care should be taken when bathing to wear a plug of cotton wool in the ear, as the water is often highly polluted, and this precaution will to a certain extent prevent the germ-laden water from coming too closely in contact with the delicate membrane of the drum.

A discharge from the ear is a common complaint in childhood. The fluid may be thin and watery, and this is often associated with a cold in the head. This condition usually gets well with the disappearance of the cold. It requires careful watching, however, because inflammation may develop and be the starting-point of a chronic ear discharge. These purulent discharges are usually the sequel to some infectious disease such as scarlet fever, measles, or whooping-cough. The condition spreads from the unhealthy state of the nose and throat, along the tube which leads up to the ear from this region. Chronic discharging ears should always be regarded as serious affections, as not only may the health of the child be impaired by the constant presence of a septic focus, but there is usually more or less deafness, and there is always the potential danger of an abscess developing either in the bone behind the ear or in the brain. One cannot too strongly emphasize the importance of early and active treatment in such cases. It is imperative that such children should always receive medical advice, as soon as the condition is discovered.

Deafness is one of the conditions which very materially hampers a child's intellectual development, especially where it is persistent. There are varying degrees of severity, and many causes contribute to the defect, *e.g.* the pressure of wax, a chronic ear discharge, adenoids, &c. The hearing is usually tested by means of a loud whisper at a distance of 20 feet. Any child who cannot hear thus is deaf, the degree depending on the distance at which he hears the sounds. Probably most cases of deafness in children are remediable, especially if they are taken early enough. Consequently where it is discovered that a child is persistently deaf, even though only slightly, it is advisable to seek the opinion of a competent judge on the question, instead of waiting indefinitely in the hope that as the child grows older he will get better. This waiting may mean that the chance of treatment in a favourable stage of the condition has been lost, and in consequence the result of the treatment may not be so good.

Where it is found to be impossible to remedy very defective hearing, instruction in a special school is necessary to enable the child to make any progress and become a useful member of society.

EYE

The eye is a complex optical apparatus more or less comparable to a camera. It is a comparatively globular organ, consisting of a series of media which bend the rays of light coming from an image so that they meet at a point on the retina. From this the impressions pass to the brain, where they are interpreted into the picture that we see. The most important of these media are the lens, which is situated within the eye and has a convex shape, which can be altered by the contraction of a little muscle called the ciliary muscle; and the cornea, which is the curved outer surface of the eyeball, and which is situated in front of the pupil.

At birth the apparatus is defective, because in the first place a clear image is not produced owing to the length of the eyeball being relatively much less than that of the adult. Also the retina is not sufficiently well developed to appreciate variations in the amount of light, and the brain is still too immature to interpret the sensations. As the age of the infant advances, each of these factors improves, more particularly the last two. But the shape of the eyeball changes slowly, and even by the age of six or seven years it is still often too short, as compared with the adult eye.

In considering vision we differentiate between what is called distant and near vision. Distant vision refers to the appreciation of objects at a distance of 20 feet or more. When the object is within 20 feet it is termed near vision, but practically this term refers to the reading distance. This distance, viz. 20 feet, is selected because for practical purposes all rays of light coming from objects as far from the eye as this are parallel. If the object is less than 20 feet away the rays of light, instead of being parallel, are divergent before they reach the eye.

In the normal or emmetropic eye the parallel rays from the distant object are brought to a focus on the retina, with the eye at rest, that is to say without any effort of accommodation being made. But when objects are closer than 20 feet, in order to bend the rays to form a clear image, the process of accommodation has to take place. This process consists in the contraction of the ciliary muscle, whereby the lens is rendered more convex. The result of this is that the diverging rays are bent more and brought to a point on the retina. If this process had not taken place the rays would not have been bent sufficiently to bring about a clear image on the retina, but would have been brought to a focus at an imaginary point behind the retina, and thus the image would have been indistinct.

In the hypermetropic eye, which is that commonly called long-sighted, the eyeball is shortened from before backwards. This is the kind which is found in all young children. Parallel rays coming from a distant object would be brought to a focus at a point behind the retina unless the ciliary muscle were contracted. If the object looked at were within 20 feet, the muscle of accommodation would have to contract still more to enable a clear image to be pictured on the retina, and the nearer the object the greater the degree of contraction of the muscle, this increasing in greater ratio than the diminution of the distance. So that this little muscle is working all day long, for it has to contract to enable a person to see both distant and near objects. It is not surprising, then, that it gets fatigued easily, especially after close work like reading or sewing, when of course it has to work harder. The result is that the person experiences a sense of heaviness about the eyes, the words or stitches become indistinct, a headache comes on, and no sense of relief is felt until there is a complete rest for the eyes.

Now, by placing a convex lens in front of the eye, you can so bend the rays of light coming from an object that they will come to a clear focus on the retina without requiring any effort of accommodation. This practically brings about the same result as is found in the normal eye, where accommodation is only required for near objects. This is the reason why glasses are prescribed in such cases. If the explanation above has been grasped, it must be obvious that in young children the frequent use of the eyes for near work such as reading, writing, and sewing must mean that the muscles of accommodation have to be worked hard and constantly. In consequence fatigue soon ensues, for it must be remembered that in children nerve-centres get exhausted much more readily than in adults. Usually in such cases the object is brought nearer to the eyes. This produces a larger image, though not a clear one, and, in addition, the object appears brighter because it is nearer.

The practical bearing of all this is that any form of minute work should be rigorously excluded from the infants' school. Thus children up to the age of 6 to 7 years should not attempt to read print out of a book. They should not write in books or on slates. They should, above all, do no sewing, and knitting is better left until a later age. They should learn their letters or sounds and words from large printed characters on a wall-sheet or blackboard. These letters should be thick and about 6 inches long, and either white on a black background or vice versa. Instead of writing they should draw letters, &c., in sand, or make them with sticks, or print large letters on the blackboard, moving the whole arm freely for the purpose, and not attempting any of the finer movements of the fingers. As a general rule, about the age of 7 years the eye has practically grown to its full size, and there is not the same imperative need to eschew all forms of close work.

When it is considered that some 20 per cent. of school-children suffer from a greater or less degree of defective vision, it becomes certain that school work as at present carried out is having a prejudicial effect on the eyesight. There are many factors at work in schools tending to produce these defects, and most of them can be remedied. The question of efficient lighting in this connection is of great importance, because a well-illuminated object is seen with much less strain than one which is badly lighted. This subject is discussed further later on under the heading of lighting of schoolrooms. Much harm is done at home by reading and doing other close work in a dim light.

All materials used should be of striking contrast, so that there is great definition of the objects illustrated. Where ink is used it should be a decided black and not a watery imitation. Copybooks should have their lines distinctly marked; the custom of faint ruling is to be deprecated. The paper of books should not be glazed, as this causes much strain from the glare produced. The paper should not be so thin that the printing on the other side shows through. The printing should be bold and distinct. The recently issued report of the British Association Committee on the influence of schoolbooks on eyesight says: "The size of the type face, *i.e.* the individual letter, is the most important factor in the influence of books on vision. Legibility depends mainly on the height and breadth of the short letters, for the larger the type the further from the eyes can it be read with ease; and it is of the first importance to induce the young reader to keep a sufficient distance between eyes and book. Children under 7 should be able to lean back in their seats and read from the book propped up on the far side of the desk." With reference to Bibles, prayer books and hymn books, the report states: "It is to be regretted that these books are so frequently printed in type which is injurious on account of its small size. It is desirable that the standard given in the table should not be lowered with respect to these important books, which are frequently used under poor conditions as regards illumination."

A good margin is necessary, and Mr. Bishop Harman suggests the following formula: "The sum of the widths of the margin should not be less than half the width of the line, and of this width one-third should be the margin against the binding."

The following specimens of printing conform to the recommendations of the Committee for the various ages:

This type is suitable for children under 7 years.

A child's eyesight

From 7 to 8 years.

A child's eyesight will

From 8 to 9 years.

A child's eyesight will be

From 9 to 12 years.

A child's eyesight will be tested

Over 12 years.

A child's eyesight will be tested free of

No child should ever work or read at a closer distance than 10 to 12 inches from the eyes. If children habitually work within this distance they should be taken to a doctor to have their eyes examined.

Defective vision may be due to many different causes, of which those which most concern us are:

(1) Opacities on the cornea. These are usually the scars resulting from an ulcer on the surface of the eyeball. Little can be done to improve this condition. It should be tackled at the earlier stage, when the eye is inflamed. If prompt and adequate treatment is obtained, then the risk of a scar remaining is very much less. Neglect in the early stage means that the ulcer gets deeper, and a scar must be the outcome after healing.

(2) Defects in the shape of the eye. These may be simple or complex, and roughly are classified as Myopia or shortsightedness, Hypermetropia or longsightedness, and Astigmatism. In this last condition the curve of the eye in one plane is different from that in another. There are many varieties of this last kind of defect.

Myopia is not so common as the others, at any rate in this country, but it is sometimes a very serious defect because of a tendency for the condition to become more marked. It is associated with school life, and seems in many cases to be due to school work; at any rate it is much exaggerated thereby. Consequently it is best for those who have a comparatively high degree of defect to avoid much study. Children with marked myopia cannot be taught in an ordinary school without harm arising. They require separate tuition with special desks and no books. Ordinary work aggravates their condition.

Hypermetropia has already been considered.

Astigmatism is one of the commonest causes of headaches, some of the slighter degrees of this defect giving rise to considerable distress. Consequently, if a child persistently suffers from headache after using his eyes, even though he appears to see perfectly well, there may be some such slight defect, and it is wisest to have the eyes tested by an oculist. We would urge here the importance of consulting an eye doctor in cases of defective vision in children, instead of attending an optician or chemist who prescribes glasses.

SKIN

The skin fulfils many important functions. Not only is it a protective covering for the different organs and tissues, but it excretes waste products in the sweat, and regulates the temperature of the body. It also is the seat of the appreciation of tactile sensibility, and contains the delicate nerve-endings which convey a sensation of pain whenever the skin is injured, and so enable the part to be removed from the source of injury. Consequently the importance of maintaining the skin in a healthy condition becomes very obvious.

In performing its excretory process it gives off sweat, which may dry on the body and leave the solid waste products there. It also secretes an oily substance, which makes the surface greasy. All the time it is liable to contamination from outside dust, and this clings particularly to greasy bodies. The superficial layers of the epidermis, too, become dead and are cast off.

Owing to the accumulation of these waste matters, &c., the pores of the skin are liable to become choked, and health must suffer from the inability of the excretory products to escape freely.

The removal of all these waste products is essential to health, and so it is imperative that the skin be frequently and periodically cleansed. This is best carried out in a hot bath, as cleansing is facilitated with hot water. A daily bath is preferable, and is best taken in the evening, as the warmth helps to induce a soporific effect. A weekly bath is a necessity. Care should be exercised that the child has not just finished a meal. At least half an hour should elapse, and preferably an hour.

The choice of soap is a very important one in the case of children, as their skins are more sensitive to any source of irritation.

Soaps are formed by the combination of an alkali with fat. They are either hard or soft. In the former soda is used, and in the latter potash. Hard soaps are used for toilet purposes. They may be neutral, alkaline, or super-fatted. Neutral soaps are the best to use because there is no free alkali in them. When they mix with water the soap breaks up to a certain extent and sets free some alkali, which combines with the greasy matter on the skin and thus hastens its removal. Alkaline soaps contain an excess of alkali over that combined with the fat, and this is liable to produce irritation of the skin. Consequently such soaps should not be used for toilet purposes.

Super-fatted soaps have an excess of fat to make sure that there is no free alkali. The drawback to their use is that hot water is necessary to bring about a lather.

Cheap soaps are often made of rancid fats, and are highly scented to disguise this. They are apt to irritate the skin, and so should be avoided. Soft soap contains a good deal of alkali free, and is chiefly used for the removal of scurf from the scalp. It should not be used on the body.

One function of the skin which it is important to have acting properly is that whereby the blood-vessels in the skin react to the stimulus of the outside temperature, and so control the loss of heat from the body. A ready response on the part of the skin to sudden changes of temperature prevents the body from losing heat unduly should the weather suddenly turn colder. This response varies considerably in different individuals. One of the best ways of inducing a quick response is the practice of taking a cold bath every morning. The immersion should last for a short time only, about half a minute or so. The idea underlying this treatment is that the sudden exposure to cold causes all the blood-vessels in the skin to contract, and the blood is driven into the internal organs. If the person comes out at once and dries rapidly with a rough towel there is a reaction, the blood-vessels dilating again, and producing that comfortable warm glow which is so exhilarating. If the bath lasts too long the skin remains blanched, and the reaction with its healthy glow does not come, but the person feels cold and shivery, and looks blue. All children cannot endure this treatment. There are many for whom it would be very unsuitable, and who, if exposed to such treatment, would be subject to considerable discomfort and probably worse. A less severe method than the cold plunge is the cold sponge all over, and this may suit many children who could not stand the more drastic plan. Others who could not bear this might derive benefit from a tepid bath, and probably it would be possible to gradually make the bath colder, as the skin comes to react more readily.

The question of clothing in relation to the skin has been discussed elsewhere.

There are certain diseases affecting the skin which can be to a large extent prevented by watchful care and treatment. Urticaria or nettle-rash is a common complaint. It manifests itself usually as a white wheal on top of a red base. The patches may be large or small, and the trouble localised or extensive. It is due to some form of poison-absorption, either arising externally or internally. As examples of external irritants one may instance the stings of a jelly-fish or caterpillars or the stinging nettle or chemical irritants used in treating or washing clothes. Examples of internal irritants are poisons resulting from the ingestion of various forms of shellfish, mushrooms, and certain fruits. Some people are peculiarly sensitive to certain articles of diet, *e.g.* strawberries.

The presence of worms in the bowel is not an uncommon cause of this condition.

The avoidance of any of these is the surest way of preventing the trouble arising. When it does arise it is important to try and determine what has been the irritating cause, and by avoiding it in the future keep the condition from developing. The skin in children is very sensitive, and quickly responds to any irritation. Thus, a little friction, particularly if there is any dampness about the garments, will produce an erythema or reddening of the skin. Also the juices of certain plants produce erythematous rashes, *e.g.* the primula. An eczematous eruption on the face and particularly at the backs of the ears is often the result of inattention to proper drying of these parts after washing, and then going out into the wind. Cheap soaps may produce similar results, more particularly in sensitive skins, owing either to excess of alkali in the soap or to the fats composing it having gone rancid. The use of a good soap will tend to prevent such a condition arising.

Some children's faces are so sensitive that soap of any kind is too irritating. In such the use of oatmeal in a muslin bag is a useful means of cleansing where something besides plain water is required. Soft water is better than hard for washing with, and clean rain water is especially good.

Many children, especially as the age of puberty is approached, are troubled a good deal with greasy skins and blackheads. These latter are the dried-up, horny part of a little plug blocking many of the ducts of the sebaceous glands. They are common on the face, chest, and back, and may give rise to considerable disfigurement through the development of pustules behind them. Much trouble and discomfort may be saved by preventing such a condition arising. The use of plenty of soap, hot water, and friction with rough towels may be quite enough, but it may be necessary to steam the face over hot water and press out the little plug by means of a special instrument called a comedo extractor. The use of a watch-key, which is commonly used for the same purpose, is to be deprecated, as it often injures the skin and sets up irritation.

Another common affection is Ringworm. This condition exhibits different appearances on the body from what it does on the scalp. In the former it usually consists of a more or less irregular ring consisting of raised reddish patches. On the scalp there is rarely any redness, but the condition shows itself usually in patches of white scurf with short, broken hairs in it. It is a comparatively simple thing where it attacks the body, but the disease affecting the scalp is much more persistent and troublesome to deal with, owing to the fact that it involves the hair roots, which pass down fairly deeply into the tissues of the scalp. These conditions, even with treatment, usually last six months, but many last considerably longer than this, as many as three or more years elapsing before the condition is cured. It is consequently important that every precaution should be taken to prevent a child developing the complaint. Thus no child with ringworm should attend school and mix with other children. This applies to Sunday school as well as daily school. Children should be cautioned about wearing each other's hats. Each child should have a certain numbered peg to hang his hat on, and should keep to it. All brushes, combs, and towels should be separate for each child. A child with the disease should wear a linen cap, especially if he has to sleep with others.

Pediculosis or lousiness is another condition affecting the skin or its appendages, which is largely cured by prevention, in other words by constant and unremitting care. The condition is most common in the head. Some children are much more prone to suffer than others. Delicate children seem to be peculiarly susceptible. The lice may pass from one person to another through the wearing of somebody else's hat or coming into close contact with someone else's hair. They are also conveyed through the medium of public conveyances, such as railway carriages, especially those with upholstered seats.

They feed on the scalp and give rise to itching, which makes the child scratch and produce sores on the head.

The only way to deal with the disease is to kill or remove both lice and nits. The latter are the eggs, which are laid on and firmly cemented to the hairs.

Where children are exposed to infection the nightly use of a fine toothcomb should be quite sufficient to keep the child free. In school it is best to have the hair plaited, as this lessens the risk of spread of infection. For the removal of nits from the hair the following plan, suggested by Dr. Pritchard, is of value: "One part of soft soap is mixed with three parts of boiling water and applied to the heads of the children as hot as they can stand it: it is then worked up into a fine lather and allowed to remain on the head for ten minutes; the lather is then thoroughly removed from the hair by combing with a fine toothcomb, which should be frequently washed in hot water during the process."

Where body lice are troublesome the undergarments should be boiled, if possible, to kill the nits, which are mostly laid in the neighbourhood of the seams and pleats. Those garments which cannot be boiled should be baked in the oven.

The use of sulphur ointment rubbed on to the body occasionally is a good preventative, and likewise the dusting the sheets with flowers of sulphur. Where the house is infested the sanitary authorities should be approached to disinfect the place.

One of the commonest affections of the scalp is the presence of dandruff. This may be in the dry, scaly form, or the scales may be matted down by excessive greasiness and produce a dirty brown discoloration of the scalp. Conditions like this should not be allowed to remain. The best way to prevent the trouble starting is to increase the circulation in the scalp. The hair should be well brushed for at least five minutes a day. Massage of the scalp with the finger-tips daily will so stimulate the flow of blood that the skin and the hair roots will be in a thoroughly healthy condition. The discarding of a hat will assist this.

Corns are ingrowths of epidermis. These become hard and horny, and when pressed on to the sensitive nerve-endings by the boot-leather produce pain. Corns are produced by the intermittent pressure which occurs when ill-formed or tight-fitting boots are worn. Therefore the wearing of broad-toed, properly-shaped shoes is the most important part of the prevention of this painful trouble.

Chilblains are particularly common among children with defective circulation in the extremities. They arise most commonly in cold weather. A sudden change from hot to cold water, or vice versa, may cause them to develop. Usually the general health of the child is below par.

The steps which should be taken to prevent the condition arising are adequate and warm clothing, especially over the extremities. Thus woollen gloves should always be worn, and put on before the child goes out of doors. Stockings should be woollen, and there should be no garters or tight boots. Warm water should be used to wash with. The child should be encouraged to exercise freely, especially first thing in the morning. He should not sit and mope about. The diet should be ample, and contain plenty of fatty food. Cod-liver oil may prove helpful.

The nails of a child should be cut carefully with rounded ends. They should always be kept short, for not only are they less unsightly, but any risk of transference of the eggs of threadworms from the outlet of the bowel to the mouth is considerably lessened.

The skin on the nail root should always be pressed back by means of an orange-stick instead of being allowed to spread over the nail, when it so often becomes cracked and may give rise to troublesome sores.

The habit of nail-biting should be checked at once, as it renders the nails unsightly, and may produce an injury by their being clipped off too close to the nail bed.

NERVOUS CHILDREN

The Causes, Character, and Health.—The temperament of children varies much, but one may recognise certain types. These types are distinct, but all children do not conform to them, for there may be intermediate grades. First, then, there is the dull, phlegmatic child, who is roused with difficulty, slow in thought, quiet in disposition, and sluggish in action. Again, there is the sunny child, whose temperament is equable, who takes life easily, readily makes friends, and is very even-tempered. Then there is the nervous, excitable child, with whom we are more particularly concerned, for it is in this type of child that the neglect of certain little points of hygienic importance may give rise to disastrous results. These nervous children are very emotional. Their brains are on a higher level than the others. It is from this class that the infant prodigies and geniuses arise, and this type is the greatest source from which the mentally unstable are drawn. There are two main groups—(*a*) those children who exhibit little or no power of self-command; and (*b*) those in whom there is great capacity for self-control.

The characteristics of those in the first group are as follows: They are usually very eager and energetic for the time being, but this feverishness soon dies down. They are restless, always wanting to be doing something or other, but soon tiring of it and giving it up for something else, which in turn is cast aside. They lack the power of application. They jump to conclusions. Quick to grasp a thing they soon forget it. They have little capacity for judgment. Usually very imaginative, they are easily frightened, and petty things worry them. Easily upset, they soon become peevish. They show affection readily, but it is not always deep, and they are often selfish, volatile, and garrulous.

In appearance they are often thin and spare of frame. Their complexion is pale or sallow, and they exhibit dark circles under the eyes. There is often a restlessness of the eyes and a fidgetiness of the fingers, and a tendency to pick or bite their nails. They wriggle about on a seat and seem to find it impossible to keep still. Their appetite is fitful and they are fanciful in the diet. Their digestion is often easily upset without apparent cause. They are prone to suffer much from functional nervous disorders.

In the second group you have a better type, those who feel keenly but do not let their feelings run away with them. They have great power of self-restraint. They are intelligent and observant, and, unlike the former type, are able to apply themselves to work without getting tired of it. In fact they often work so hard that they overdo things. In many ways they are the reverse of those in the first group. They are imaginative, and if carried to extremes, maintain their point of view stoutly. They soon grasp an idea and retain it. They are reticent and often self-absorbed. Slow to show affection, they are tenacious in preserving it. Their judgment is usually sound. They are very sensitive, and keep things to themselves. These children do not present any particular physical characteristics.

Those excitable children in the first group are peculiarly prone to suffer from various functional nervous disorders, which may give rise to a great deal of distress, although many of them are of little consequence. They are chiefly of the nature of over-action or irregular or abnormal action of the nervous system. The causes which lead to the occurrence of these disorders are nearly always traceable to the inheritance of some neurotic traits. They occur in children who come of a neurotic stock, and who are of an emotional type. The nervous system of these individuals is in an unstable condition, and consequently any slight thing may be the cause of an outbreak. Thus the presence of any local irritation, whether in the form of teething, adenoids, or worms in the bowel, may give rise to convulsions or other forms of nervous disorder in the child of neurotic parentage, which would produce no effect in the child of parents with a more equable temperament. Consequently these children require much more careful treatment than others, both at home and at school, from every point of view, in order to bring them up with the minimum amount of nervous exhaustion. We may briefly indicate some of the nervous disorders to which such children are more liable.

Habit Spasms.—These are spasmodic twitchings of certain muscles, *e.g.* constant blinking of the eyes, or the sudden jerking of the head to one side.

Night Terrors.—These are bad dreams, the child starting up screaming, though not necessarily waking up. They often occur about an hour or two after the child has gone to sleep. They are often attributed to disorders of the digestion, but the chief cause is the unstable nervous system which misinterprets the exciting cause; *e.g.* the obstruction to breathing caused by adenoids or covering the face with the bedclothes gives rise to an impending feeling of suffocation. As a rule these paroxysms disappear as the child grows older.

Day Terrors.—This is a similar condition but less common. It is characterised by sudden screaming and unmistakable signs of fright. The effect is produced by an auditory or visual hallucination.

Somnambulism or sleep-walking is another exhibition of the same nervous instability.

All these disorders should be looked upon as danger signals, showing that the brain is being driven at too great pressure.

Nocturnal Incontinence of Urine.—Where this distressing complaint continues into childhood it is nearly always associated with the neurotic inheritance, and in such cases may be regarded more as an example of the uncertain control which the higher nervous system has over the lower than as any disease in itself. Such conditions usually right themselves as the child grows older.

Chorea, or St. Vitus' Dance, is another condition which occurs mostly among such children as we are considering. It is associated with rheumatism, and is in fact a form of rheumatism which affects the nervous system. Rheumatism is more likely to take this form in neurotic children, especially after a fright or shock of any kind; sometimes even the return to school after a slight attack of rheumatism may bring it about.

Epilepsy.—This is one of the graver diseases that occurs much more frequently among nervous children than among others. It occurs in two main forms—the severe type with loss of consciousness, and the slighter attack, which may be looked upon as a passing giddiness or absent-mindedness, &c. It arises most commonly in childhood at the periods of second dentition and puberty, and consequently any child who has had convulsions should be watched carefully at these times.

As a rule it is not a difficult matter to recognise a nervous child, but it is very important to do so and to order the child's life accordingly. These children should preferably live in a sedative climate, because the air is less stimulating and there is a greater likelihood of repose. They should have great regularity in the matter of times for meals, sleep, &c. To a certain extent their capricious appetites should be humoured. The food should always be served up in an appetising form to tempt their palate. They should be out of doors as much as they can, and if possible should attend an open-air school. It is important, though, that they do not rush about too much. Adequate rest during the day is very essential, and an hour in the reclining or recumbent position at midday would prove very beneficial. They should go to bed early, and if terrified of the dark should have a light in the room. The windows should be wide open. If necessary the bed should be warmed. They should avoid all forms of excitement, particularly before going to bed. There should not be a heavy meal just prior to bedtime. It is better to postpone their attending school as long as possible. They should not attend as early as the average child. The amount of schooling should be determined by the state of their health. There should be no overtaxing, no home lessons, and plenty of relaxation. Parties, theatres, and cinemas should be avoided, and the life led should be as quiet as possible.

Attention to such points will give these children a much better chance of avoiding some of the functional disorders, &c., which we have indicated above.

BONE AND MUSCLE DEFECTS

Under this heading we propose to say a few words about the minor deformities only. They are most commonly met with among the older children, especially those who are growing rapidly as they approach puberty. Such deformities if they are recognised in time are usually remediable with the exercise of care and attention to little details. A short description of some of the commoner conditions may prove serviceable.

Deformities affecting the Spine.—One of the commonest of these is that known popularly by the term "round shoulders." There are two forms of this defect: (*a*) simple round shoulders with the lower part of the back comparatively flat. This form is known as simple kyphosis, and is common in young children. The condition is usually due to faulty posture. Many cases in girls are due to the bad shape of their stays, which are too narrow in front. This necessitates a forward movement of the shoulders to ease off the pressure on the front of the chest.

(*b*) A more marked bending of the shoulders, with a compensating arch in the small of the back projecting the abdomen forward. This deformity is a more rigid one. It is common in older children. Flattening of the chest and deficient expansion of the lungs result from it.

These defects can be prevented by care on the part of the parent or teacher. Thus all clothing should be loose and properly shaped. A correct posture should be insisted on both when sitting and standing. Any conditions, such as defective sight, which make the child stoop should be corrected. Where the muscle tone is weak there should be plain, wholesome feeding, plenty of open air, and proper exercises for the muscles.

Lateral curvature of the spine is also very common among children. Statistics in different countries give an average of about twenty-five per cent. of cases with some degree of the condition. The proportion seems to be about equal in boys and girls. The nature of the curve varies, but the commonest is a long one with the convexity to the left. Seventy per cent. of the cases belong to this type. These lateral curvatures may be due to an irregularity in the length of the two limbs, or may be produced by habitually standing with the weight of the body on one leg, or sitting with the body tilted to one side, as is often the case in writing, or carrying heavy weights always on one side. Correct posture, general hygienic measures, and exercises for the muscles of the back ought to prevent most of these curvatures from arising.

Exercises which are specially suitable for preventing or removing spinal curvatures are as follows. They are detailed more fully in the Syllabus for Physical Exercises of the Board of Education.

(*a*) Head exercises—bending backwards and sideways, and turning.

(*b*) Trunk exercises—bending backwards, forwards, downwards and sideways, and turning.

(*c*) Shoulder exercises—arms raising forward, upward, and sideways.

Deformities of the Foot.—One of the commonest of these is flatfoot. In this condition the arch has given way, and the whole or almost the whole of the sole of the foot touches the ground. It is a condition which interferes much with the usefulness of the foot, and if taken early is very amenable to treatment. There are various degrees of severity. In the earliest stage the arch returns when the weight of the body is removed or the person rises on his toes. In the second stage the muscles, &c., are weaker, and the arch cannot be regained except by manipulation. There are other degrees more marked still. To prevent the condition arising or cure it in its earliest manifestation the child should practise tiptoe exercises, standing on the outer border of the foot and walking thus, resting as soon as walking or standing produce fatigue. Cycling and skipping are also good exercises. In the second stage it is necessary to wear a metal plate inside the boot. The major degrees we are not concerned with, except to state that neglect of the simpler deformities is likely to lead to the development of the more marked defect.

Another common deformity is pes valgus. This means that the person walks on the inner edge of the foot, and the ankle bone projects more and is nearer to the ground. The treatment is the same as for flatfoot.

Pes cavus, which is the opposite defect to flatfoot, is not uncommon. In this case the arch is excessive. A slight condition of this nature is sometimes met with in adolescent girls, and the cause has been attributed to the wearing of tight, short shoes with high heels. In other cases the defect is due to organic diseases of the nervous system, &c. The condition is often a troublesome one, owing to the frequency with which corns develop on the soles of the feet. The wearing of thick woollen soles to the stockings tends to lessen the likelihood of their appearance.

Posture.—It is convenient at this point to describe what is the best posture to adopt when at work, &c.

In sitting the pelvic bones should rest comfortably in the concavity of the seat, and should press equally on it. The head should be almost vertically above this point and the spinal column erect. Both arms should rest equally distant from the spinal column. The feet should be firmly planted on the floor and the legs straight. This posture is less fatiguing than where the head is thrust forward, in which case the muscles supporting the head are being constantly exerted to prevent it falling further forward. The important points to guard against are sitting in a twisted position, whereby the muscles of one side are more contracted than those of the other. If such an attitude is persisted in there is great likelihood of the development of spinal curvature. Such attitudes are adopted to obtain better lighting or to prevent copying, or because the desks are not of suitable size or form.

It is also important to prevent the body doubling up with the back bent and the shoulders drooped forwards. This faulty attitude, if continued, results in a narrowing and flattening of the chest from insufficient respiration, and a permanent forward curve of the spinal column. Such a condition is especially likely to occur in children who cannot see clearly, and who are developing a habit of placing their eyes too near their work. It also develops easily where there is no back rest to the seat, and the seat itself is too far back from the desk.

For standing the best posture is one with the heels slightly apart and the toes pointed outwards, the feet firmly planted on the floor, neither foot being in advance of the other. The body should be erect, with the chest well forward and the abdomen well back. The head should be well raised and look straight forwards. This attitude cannot be maintained for long, and to relax the muscles first one foot and then the other should be advanced.

Bad postures in standing are common. They are often secondary to faulty attitudes in sitting.

All children should be carefully watched to see that they adopt a correct posture, but this is especially important if they are anæmic, or convalescing from some illness, or neurotic. In such children the muscles or nerves controlling them soon get tired, and there is a tendency to relax them, with resulting bad posture.

It has been stated elsewhere how necessary it is to have frequent intervals of rest following bouts of activity. Children soon get tired of attempting to maintain a certain position for any length of time, and so there should never be any prolonged sitting without an interval for drill exercises.

For writing the child should sit perfectly square in the desk, with the body slightly sloped forwards and the head straight. The left arm should support the page, which ought to be straight in front. The book should be parallel with the desk if upright writing is required: if a slight slant is desired the book should be slightly tilted to the right. The right arm should rest on the desk. The pen should travel at right angles to the edge of the desk and the letters be formed boldly.

For reading it is best to stand up with the chest well thrown forward and the head erect. The book should not be held nearer to the eyes than ten to twelve inches. The child should stand so that there is a good light falling on the page of the book. If sitting, the same position of head and chest should be adopted.

AGE OF ATTENDING SCHOOL

The answer to the question as to when a child should attend school must vary to a large extent according to the social condition of the child. Where it is possible for him to stay at home and have adequate supervision over his welfare, and a certain amount of instruction and training, there is no reason for his attending school until he is seven or eight years old. In fact he is better at home, because in the first place there is greater risk of infection when children congregate together, and the longer the development of infectious diseases can be postponed the less the likelihood of a serious form of the disease arising, and the stronger the child to cope with it. Besides, there is the tendency in all schools to set work which entails a considerable strain on the child's eyes, and if this work can be postponed till the age of seven years there is much less risk of strain. Further, the hours of work which a young child should have are so short that there is little to gain by it. Although the child who stays away from school until he is seven or eight years may be backward at first, he soon makes up for lost time, and later on is more likely to exhibit greater mental capacity than if his brain had been forced by premature work.

In the case of children who attend elementary schools the case is somewhat different, because the majority of mothers in this class are not able to devote the attention to their children's welfare which is desirable, either because they have to go out to work or because their time is fully occupied otherwise at home. Consequently we are of opinion that these children should be allowed to attend school when they reach the age of five years, but this should not be compulsory if the parents are able to give them individual attention at home. They should not be permitted to come before five years of age, because of the greater mortality from infectious diseases among children younger than five.

For those who come the hours of real work should be very short. The time should be chiefly occupied by various forms of play, object-lessons, and story-telling.

The main aim, at this early age, in our opinion, should be to inculcate the habits of discipline, observation and attention; to impart general knowledge, more particularly with regard to natural objects; and to improve the physical health.

SCHOOL PREMISES

In choosing a site for a school it is important to pay attention to its surroundings. Thus where possible an elevated site should be chosen, shielded from the cold winds, for a boarding school. The subsoil should be such that water does not collect and remain in it.

For a day school the question of convenience of access is a necessary one, but such a school should not be situated, if possible, in positions where there is much vehicular traffic. Made ground, *i.e.* an old hollow which has been filled up with house refuse, &c., should never be chosen as the site.

There should be plenty of open space round the school, fields if possible, but at anyrate there should be a playground large enough to give at least 30 square feet for each child. The surface should be smooth, and preferably made of asphalt or tar paving to eliminate dust as far as possible. Gravel or cinder ashes are unsuitable, the former because it is rough and the children are likely to fall easily and hurt themselves; the latter is dirty and makes the school floors filthy. There should be no trees near the building to block out the sun and light from the rooms, but they are desirable further off as shelters for open-air classes, &c.

The building should be so planned that the rooms occupied by the children get as much sun as possible, and in the case of boarding-schools this applies as well to dormitories as class-rooms.

Dormitories for girls' schools should contain cubicles with a separate window to each. This gives a certain amount of privacy, which is desirable. For boys' schools we do not advocate the cubicle system, but think that small rooms containing four to six beds in charge of a senior boy are preferable. The ventilation in these rooms should be adequate, and hopper windows are the best for admitting air without a draught.

Cloakrooms should be well lighted and ventilated, and should have hot pipes to dry the clothes. Corridors should not be utilised for this purpose. The pegs should be twelve inches apart, and should be numbered.

They should contain lavatories, and we think the best type is a fairly wide glazed trough. The water should come through rosettes in a series of taps or through perforations in a pipe. This system of washing in running water is preferable to any other.

If the water comes through a cistern, one or more taps direct from the main should be installed for drinking purposes. It is important that the cisterns should be periodically cleaned out.

We have no experience of the practicability of drinking from rising jets of water instead of from cups, but if the method is found to be free from difficulty we regard it as the ideal system for drinking in a school.

Closets should be separated from the school. When there is a water supply and a drainage scheme the best type is the wash-down pan with a separate flushing tank for each. There should be a minimum of woodwork about the seats. A proper supply of paper should be provided.

In rural districts the earth closet or some modification of it should be adopted.

The number of closets should be about one to every forty boys, and one to every twenty-five girls.

In boarding-schools there should always be one or more closets close to the dormitories for use at night-time if necessary. They should not be in any way connected with the room.

There should be ample urinal accommodation, about one foot to every ten boys. Some form of non-absorbent glazed material is the best. A good flush should be installed, and this should be preferably arranged to act automatically.

Schoolrooms.—These must not be above a certain size, partly because if the room is too big there is too great a strain on the teacher's voice, partly because if lighting is only from the left the width of the room must be limited in order to get sufficient light on the far side. Thus if the top of the windows is 13 feet high the room should not be wider than 25 feet. If 14 feet high the width should not be more than 30 feet.

The Board of Education gives the minimum floor space for elementary schools as 10 square feet per child, for secondary schools 18 square feet. It would be better if the minimum in the former case were raised. A convenient-sized room is one measuring 20 feet by 25 feet and 13 feet high. This gives accommodation for fifty children on the minimum scale of the Board. A raising of the space to 12 square feet would mean that the numbers would have to be reduced to forty, and this would be preferable from every point of view.

The doors should be made to open outwards in case of panic. The floors should consist of small blocks fixed on to cement.

Cleansing of School Floors.—It is important in connection with this to see that as little pollution as possible takes place, and so there should be wire scrapers and mats on which to cleanse the boots before the children enter. The use of indoor shoes, where possible, is a distinct advantage. However, in spite of such precautions, the amount of dust which accumulates is astonishing. This dust, when movements take place, is stirred up into the atmosphere and is then breathed in. As germs often are attached to the dust-particles it is obvious that the prevention of dust rising is a very important hygienic measure. The best means of attaining this end is the covering of the floor with some oily preparation.

The floor should be first of all well scrubbed with soft soap and water. After it is dry, fresh and colourless oil should be laid down thinly and evenly, using a felt mop or rubber for the purpose. It takes time for the oil to sink in, and so this treatment should be carried out at the beginning of the holidays. This process should be carried out three times a year—less oil being required on the subsequent applications. The floors should always be well scrubbed before a further coating of oil is given.

Floors treated in this way retain the dust-particles when they fall, and thus keep the atmosphere purer. They require to be swept daily with a hard brush, but this process does not result in clouds of dust rising up. Once a week the floors should be wiped over with a damp cloth.

Many experiments by numerous observers have proved how marked is the improvement in the atmosphere when such preparations are used.

The treatment makes the floors more durable, and renders cleansing easier, quicker, and healthier for the caretaker.

The disadvantages are that the floors become darker, but this is not a very great drawback if the rooms are properly lighted. They are also more slippery at first, but if plenty of time elapses for the oil to sink in this tendency disappears. At least three days should pass, after the application, before the rooms are used. Soiling of the clothes is also complained of, but this can be obviated by wearing short skirts, &c.

The advantages far outweigh the drawbacks, and besides the cost is not excessive.

Children have to spend a considerable time in schoolrooms, and usually there are so many others in the room that the problem of adequate lighting, ventilation, and heating becomes a very important one.

Lighting.—Owing to the reasons set out in detail elsewhere, for the avoidance of any form of eye-strain the question of efficient lighting becomes of paramount importance.

The chief source of light should come from the left-hand side, because if it is in front there is a glare in the eyes, if from the back the child is working in the gloom caused by his own shadow, and if from the right only, a shadow of the right arm is cast on the page when writing.

Roof lighting is also inadvisable because of the shadows which it causes as well as for other reasons.

The windows should rise from 4 feet above the floor level right up to the ceiling, which should be 13 feet high. They should also extend from the back wall for about two-thirds along the left-hand wall. This makes the glass area about one-fifth of the floor area. The glass should be clear, and never frosted or coloured.

Windows giving supplementary light from the right are advisable, more particularly from the point of view of ventilation. If the light from the left is adequate, as it should be, the panes of glass on the right-hand side should be of opaque or coloured glass to cut off some of the lighting and thus diminish the effect of the cross lights in producing shadows.

In order to obtain the maximum effect from the light which does enter, the walls should be painted a light green or cream colour, the lower 4 feet being of a darker tint. The walls should be smooth but not shiny. The furniture should be made of light-coloured wood. No trees should be allowed to obscure the entrance of light, and creepers should be kept well trimmed.

Artificial lighting is of as much importance as natural. Electric bulbs are the best, because they do not vitiate the atmosphere, they can be easily placed at any desired spot, and the light is steady. The filament should be a metallic one, and this should be shaded to protect the eyes from the glare.

Incandescent gas is next best, but the glowing mantle also requires to be shaded. Ordinary gas jets are not sufficient, and should never be permitted. In country districts oil lamps are the only means of illumination, but the light is quite inadequate for school purposes, and all work should cease when the daylight gets too dim.

The position of the lights is of importance. They should be so situated, 6½ feet from the floor, that the lighting falls chiefly from the left side of the child. There should be four globes, and they should not be too near each other. A rough test of adequate lighting is the ability to distinguish at a distance of 10 feet a row of dots 1 millimetre square separated from each other by 1 millimetre.

There should be a separate light for the blackboard, and one side should be guarded by a shield to avoid the glare in the scholars' eyes.

Ventilation.—The reason why ventilation is necessary is because the air becomes impure through the respiration and exhalations from the bodies of people, and also from the combustion of gas, &c. If these impurities are not removed most people sooner or later experience a sensation of discomfort, langour, and diminished power of concentration, &c.

There are two main ways of ventilating rooms—one by means of artificial aids causing a circulation of the air, the other the natural method through the medium of open windows and various other contrivances for admitting and removing air.

The question as to which system to adopt depends largely on the amount of money available for expenditure. The adoption of an efficient system of mechanical ventilation has a much greater initial cost, but the annual cost does not appear to be much greater than is the case with natural ventilation.

The best system is a combination of the two varieties of mechanical ventilation, by means of which air, which has been purified, warmed, and moistened is propelled into the room, and the vitiated air removed by an extraction fan.

Experimental observation has proved that the air in schools where this system has been adopted is much purer than that in other schools. It contains less carbon dioxide, less organic matter and fewer germs. However, the expense is the great drawback to the universal adoption of some such method, and so the question of what is the best means of natural ventilation becomes of importance.

If adequately carried out there is no reason why this system should not prove quite sufficient. The great point to be observed is that the whole air of the room should be changed, and not only a portion. The use of hopper openings in the window area is the best way of admitting air, because the air is directed upwards, and so a direct draught is avoided. These openings are obtained by hinging the windows at the base so that they can fall inwards and allow air to enter. There should be flanges at the sides so that all the air is directed upwards. The whole of the lower half of the window should contain these hoppers. The top windows should be made to swing open so that air can blow right through when necessary.

To obtain adequate change of air there must be cross ventilation, and so similar openings should exist on the opposite side of the room. According to the direction of the wind one or other side acts as an inlet for the pure air and the opposite side as an outlet for the used-up air. The total size of the inlets should be such that there are 36 square inches for each child. These window openings may be supplemented by Sheringham valves situated in the walls about 6 feet above the floor.

Heating.—Various methods are adopted for warming schoolrooms: (1) open fires; (2) closed-in stoves; (3) hot-water pipes.

The open fire is cheerful, but is wasteful, inasmuch as most of the heat escapes up the chimney and only about one-tenth is of use for heating purposes; besides, the heat is localised and does not tend to warm the room.

Closed-in stoves are not so wasteful of fuel, but their heat also is localised, and they so often dry the air and render it noxious by giving off fumes.

The cleanest and best form of supplying heat is by means of hot-water circulating in pipes. This may be a low-pressure system, where the water is heated in a boiler and distributed by means of 4-inch pipes round the sides of the room: or a high-pressure system, in which the water is heated in a coiled pipe in the fire and is distributed through narrow pipes. In this latter form the temperature can be raised and lowered much more rapidly, and so can be more easily regulated for sudden changes of weather.

Where ventilation is as free as has been suggested it is important to have an adequate heating surface to maintain the temperature of the room at from 56° to 60°. It has been calculated that to raise the temperature of air from 30° outside to 60° inside, 5·7 square feet of heating surface per child will be required. This means about 4·8 feet of 4-inch pipe; and for a class-room to accommodate fifty children 240 feet of such piping would be required. The pipes should be arranged in three rows around the room, and the top two rows should be supplied with valves so that the heat may be cut off from them in milder weather. Thus, should the outside temperature be about 40° F. two rows of pipes would be sufficient; at 50° F. one row.

The above system of ventilation and heating is based on the practice adopted in the newest schools in Derbyshire, where they have been found to give very satisfactory results.

School Furniture—Blackboard.—This should be of a dull unglazed black. There is then no risk of reflection from its surface.

White chalk should be used, as the aim is to obtain as marked a contrast as possible to avoid eyestrain. The chalk should be of the kind known as dustless.

Books.—These should not be too heavy to hold, and when opened should remain open. The paper should not be glazed. The print should be of a deep black, and its size should vary according to the age of the child (see section on Vision).

Maps with minute printing should be avoided.

Desks.—There is no doubt that the single desk is the best from every point of view except that of expense. For with such a desk you can grade the sizes better; besides, the child is not so liable to come into close contact with his fellows, which is of importance in connection with infectious diseases; and it tends to reduce the size of the class, which cannot but be of benefit to everyone concerned.

In deciding on a desk it must be borne in mind that various positions are adopted for reading, writing, and listening, and a desk should be chosen which gives the best results for each of these with as few disadvantages for the other positions as possible.

One of the most important points to consider is to have a considerable range in sizes, for children of the same age or standard in a class vary considerably in height. It is an advantage to have the seats and desks adjustable.

The seat should not be too narrow; its width should be about two-thirds that of the thigh. It should not be flat but slightly concave, and tilted backwards so as to prevent slipping forwards. The height of the seat should be such that the feet can be comfortably planted on the floor with the thigh parallel to the floor and the leg perpendicular to it. The seat should have a back rest, adjustable, but capable of being fixed so that it can support the body just below the shoulder-blades. The front edge of the seat should project about 1½ to 2 inches under the back edge of the desk. It should be so arranged that it could be tilted to permit the child to stand.

The desk should not prevent the legs from comfortably adopting a proper position, and so it should not be very deep if it has to contain books. The slope of the desk should be at an angle of 15° to the horizontal. This gives the mean between the best inclination for reading and that for writing. It should be at such a height that the arm can rest comfortably on it for writing purposes, and the surface of the desk from 12 to 15 inches from the eyes.

If desks suited to the size of the child are not employed there are great risks of faulty posture arising, because of the attitudes that have to be adopted to enable the child to write, &c.

OPEN-AIR SCHOOLS

Within the last few years great strides have been made in the building and equipping of open-air schools. These have been utilised mainly for children who are ill or convalescing from some illness. Children with anæmia, malnutrition, nervous debility, those who have a tendency to tuberculosis, and those recovering from an operation for adenoids are chiefly the scholars who attend these schools. Very striking results have been obtained in these cases; the children would hardly be recognised after three months' attendance as the same children who were admitted. The drawn, tired look disappears, the plump face full of energy takes its place, pallor gives place to healthy glow, and apathy develops into activity.

There is a great future before this undertaking, and when it becomes more universal and is utilised for healthy children before they get run down, there will be a great diminution in the amount of ill-health which so often proves the starting-point for more serious disease.

Until such schools are established much may be done in the way of using existing conveniences as much as possible. Thus classes should be established out of doors under the shelter of trees or covered-in playgrounds. More nature-study rambles might with advantage take place, also the teaching of certain subjects, such as arithmetic or geography, by practical demonstration out of doors as far as possible.

The institution of playground classes in London has been attended with excellent results in the improved physical condition of the children. Dr. Branson states that "At his second visit, three weeks after the inception of the class, he felt momentarily doubtful in many cases whether particular children were the individuals he had selected. The difference was partly in complexion, but also in high degree in demeanour and expression, which was more alert and spirited. Many children regarded as apathetic and morose had become bright, energetic, and interested in their occupation."

One of the features of the open-air school, which adds greatly to the benefit derived from the fresh air, is the midday rest for two hours or so. At this time many of the children sleep.

The intellectual work should be reduced to a minimum where the school is used for debilitated children.

The school presents greater advantages when it is associated with some hostel or sanatorium where the children may have the same open-air life at nights. If they go home a good deal of the benefit must necessarily be lost when they return, as so many do, to overcrowded hovels where the windows are rarely open and the sun seldom gains an entrance.

Education and Over-pressure.—Some children are much more liable to develop symptoms of over-pressure than others, partly because they are naturally more vivacious or highly strung, or keener. The continued application to work without adequate rest results in the onset of fatigue, both physical and mental, and this shows itself at first in the tired and heavy look, the drawn face, the difficulty in balancing the head, the listless voice, the disinclination to exert himself, and if he does so the slow and often clumsy movements and the tendency to fall asleep. The night's sleep and rest should prove enough to cause all these fatigue signs to disappear, but if the over-pressure continues the child fails to obtain the needful rest, and wakes up in the morning still feeling sleepy, languid, and disinclined to get up. The expression becomes devoid of life. There may be knitting of the eyebrows or wrinkling of the forehead. The lower eyelids may become baggy. There is a want of alertness, the attitude is awkward, and the gait clumsy. The child cannot pay attention, the gaze wanders, the response is feeble, and irritability readily develops. If no steps are taken to remove the cause the fatigue continues and the picture becomes more marked. The drawn lines become permanent. The face looks pale and pinched. The eyes are dull and sunken, and heavy shadows encircle them. There are twitchings of the facial and other muscles. The outstretched hand is drooped and shows no vitality. There is an inco-ordination of movement. The child is restless and unable to get off to sleep easily, and when he does lose consciousness vivid dreams trouble him and night terrors arise. The susceptibility to disease is greater, owing to the reduced vitality, and inability to cope with slight infection.

It is of supreme importance that parents and teachers should be on the lookout for some of these signs, so that the condition may not progress, but as soon as symptoms are noticed there should be a break in the work.

Among those who are likely to easily show these signs are the readily excitable, highly strung, nervous children, those convalescing from disease, those with a tendency to rheumatism or tuberculosis. Greater care should be exercised with these children. There is too much of a tendency, which is inseparable from large classes, to consider all children as being equally capable of effort instead of making allowance for individual cases.

We do not wish it to be understood that we are decrying effort. There can be no education without effort. The exertion of effort is a necessity, if any progress is to be made, whatever the undertaking, and after it must necessarily follow the production of fatigue. But when fatigue has been produced there should be adequate rest to recuperate; otherwise there will be over-pressure commencing. Many investigators have carried out experimental tests for estimating fatigue. These tests have been based on three different methods—the physiological, in which the presence of fatigue is measured by the variations in functions of different organs; the psychological, by which the measurement of fatigue is gauged by the reduction in mental capacity; and third, a combination of the two, in which the variations in sensitiveness of the skin constitute the test.

A brief account of these methods is helpful in showing the futility of carrying on education under certain circumstances.

One of the chief methods under the first heading was the use of the ergograph. This is an instrument for measuring muscular fatigue. One finger is attached by a cord over a pulley to a weight. The flexion of the finger raises the weight a certain height. This proceeding is continued until the finger can no longer contract. The amount of work done is obtained by multiplying the weight by the height raised and the number of contractions. Dr. Kemsies, working in the Berlin schools with this instrument on holidays and schooldays, found that bodily and mental exertion reduced the muscular power after a comparatively short time. This diminution of muscular energy disappears "in one or two hours if a change is made in the work, especially if the change is from a hard to an easy subject. Severe mental fatigue, as measured by the ergograph, comes on with great regularity in the periods of mathematics and gymnastics: while on the other hand, recuperation seems to take place during the periods of history, geography, and nature-study. Modern languages occupy with respect to fatiguing power a middle place. Singing and drawing, moreover, make greater demands on those who do well in these branches."

A much better measure of fatigue, owing to the greater number of muscles involved, is obtained in more recent tests by Weichardt. He uses for school-children dumb-bells weighing 4 and 5 lbs. respectively for the left and right hands. The arms are stretched horizontally forwards, and have to be moved in quarter circles outward and back again once a second to a low word of command. With each movement the right and left foot are alternately raised to the height of the knee. After twenty to thirty seconds this easy exercise becomes heavier, and quite suddenly the arms sink in consequence of high grade fatigue. The time, which can be exactly determined in seconds, gives a measure of the already existing fatigue.

In the psychological method of testing fatigue the basis for the estimation is the variation in the mental capacity of the person, as determined by speed and accuracy of working. There have been many different tests by various observers, but space forbids more than the mention of one or two.

In 1894 Dr. Höppner took fifty children, whose average age was 9 years, and gave them dictation for two hours. He analysed the quality only of the work. He divided the task into sections, each containing about thirty words. After a period corresponding to thirty minutes' work he discovered a decided rise in the number of mistakes, which continued to the end of the time. He points out that as time goes on children become careless in their pronunciation and lapse into the dialect of their homes. The teacher's words and manner of speaking have a diminishing effect as the fatigue of the class increases.

Comparatively similar results were obtained by Dr. Burgerstein by the use of tests consisting of simple mathematical sums. These were changed every ten minutes. An interval of five minutes was then allowed, after which a further series of sums was worked for ten minutes, and so on to the end of an hour. The work done increased during each consecutive period owing to practice, but the mistakes increased in higher proportion. During the first ten minutes 3 per cent., during the second 4 per cent., during the third 5·7 per cent, and during the fourth 6 per cent. of errors occurred. He concludes from his experiments: "It seems best not to let lessons last longer than three-quarters of an hour; and to interrupt the continuation of lessons by pauses of about a quarter of an hour, so as to have the children's brains rested, the body moved, and the schoolroom air changed."

Januschke obtained results on duration of lessons confirming those of Burgerstein.

The influence of rest is demonstrated by Dr. Friedrich's experiments at Wurtzburg. He took two series, one of thirty minutes' dictation, the other of thirty minutes' arithmetic. He compared the quality of the work after each school hour on days when there was no interval, with that on other days when there was a rest between the hours. The accompanying table shows the results.

In (*a*) there was no interval; in (*b*) there was a pause at 10 A.M.; in (*c*) there were two breaks, one at 9 A.M. and the other at 10 A.M.

Time.		Per Cent. of Faults.	Corrections.	Pupils with no Mistakes.
			Per Cent.	Per Cent.
a . .	8 a.m.	·2	14	72
	9 a.m.	·3	12	60
	10 a.m.	·8	25	27
	11 a.m.	1·01	21	19·6
b . .	11 a.m.	·99	20	23
c . .	10 a.m.	·67	19	3
	11 a.m.	·6	16	35

All observers find that the most characteristic sign of fatigue is omission.

Investigations have shown that the midday rest has been insufficient to correct the fatigue of the morning. Many observers have upheld this view, and condemn afternoon work as useless, advocating that the time should be spent in rest or technical instruction.

Mr. Winch has recently shown that in the evening schools the fatigued condition of the students may cause the instruction to be quite unprofitable.

All these tests go to prove that it is useless to attempt to continue lessons beyond a certain period, as the average child cannot take in the instruction properly and the time is consequently wasted. The best results, too, would be obtained by adequate intervals of rest between the periods of work. In certain of the schools in Switzerland it has been found that increased attention and energy in the next lesson follow a pause of ten minutes after each period of work, for relaxation of mind and body in the open air.

The last method of ascertaining the extent of fatigue consists in using an instrument for testing the sensitiveness of the skin to touch. This instrument is called an æsthesiometer, and consists of two blunt points, one fixed and one movable. The two are placed on certain parts of the body. The movable point is moved away from the other until the person feels that there are two distinct points. The distance apart is then measured and recorded. Fatigue renders the sensitiveness of the skin less marked, so that the distance between the two points increases before they can be recognised as separate. Many observers have confirmed this fact, that intellectual fatigue affects the tactile sensibility.

Apart from the effect of mental work in producing fatigue, there are many other factors concerned, *e.g.* the ventilation, because the oppressive feeling induced by an insufficient elimination of heat and aqueous vapour from the body is a potent cause of the rapid onset of fatigue. It has been shown by most of the observers carrying out experiments such as those indicated above, that purer air gives increased capacity for work.

Fatigue is due to the production of poisons which inhibit the functions of different organs. These have been removed experimentally by various means, such as massage, washing out, &c. Recent work by Dr. Weichardt gives rise to the conclusion that the poisons are apparently at once destroyed in the blood. They exist mostly in muscle juice, and can also be removed from nervous structure, which rapidly recovers from fatigue when the poisons are washed out with normal saline solution. From the blood of animals treated with this poison a certain substance has been obtained which counteracts the effect of the poison—this is of the nature of an antitoxin. Dr. Lorenz in recent experiments has found that spraying a 1 per cent. solution of this antitoxin in the class-room has, after five hours' work, resulted in an improvement of 50 per cent. in fatigue results. In further experiments by the same person, he finds that exhaustion is not nearly so great on the days after using the spray, in spite of quite equal school work. When using tests similar to Burgerstein's he found that there was an increase in the quality as well as the quantity of work done after using the antitoxin spray. He concludes from personal experience that the fatigue antitoxin is able to counteract the fatigue poisons found in the body, and thus extends the limits of the working capacity of the whole organism.

If these experiments are confirmed by others, great possibilities are opened out in the development of capacity for work.

HOURS OF SCHOOL WORK

To a certain extent this must vary with the individual child, for the highly-strung child must have less than his more equable brother, for he uses up more energy in the same time. Younger children, too, require fewer hours' work than those who are older. The following table, compiled by Dr. Clement Dukes, shows the number of hours of school work per week that should be permitted according to the age of the child:

Age.	*Hours per Week.*
5 to 6 years	6
6 to 7 "	9
7 to 8 "	12
8 to 9 "	15
9 to 10 "	18
10 to 11 "	21
11 to 12 "	25
12 to 14 "	30
14 to 15 "	35

PREPARATION OF LESSONS

We think that as usually carried out this phase of school work is often detrimental to the child's welfare; particularly do we look upon it as bad where it leads to working late at nights, as is so often the case in secondary day schools.

The practice, too, in boarding schools of doing an hour's work of this nature before breakfast we regard as deleterious.

EXAMINATIONS

These apparently necessary evils lead to a good deal of excessive work just prior to the examination, and this tendency to cram and get through as much as possible in a given time is a very bad one, and is particularly pernicious where children of the nervous temperament are concerned—more particularly girls. In fact if competitive work, such as this, leads to any of the symptoms or signs detailed under the heading of over-pressure, it should be stopped, at any rate so far as those particular children are concerned.

The acme of all school teaching should be the all-round preparation of the child for the duties of adulthood. Examinations should be regarded as a small means to an end, and not as an end in itself.

PUNISHMENTS

In this connection we would only say that the custom of punishing a child by detention indoors during playtime is one which should never be enforced. Recreation time is not too excessive in schools that children can afford to lose what little they get. Hence for the sake of their general well-being, and certainly for the sake of their ability to pay attention to their work, some other form of punishment should be devised. We think this is particularly important when the cause for the punishment lies in some error or apparent carelessness in lessons. These troubles are often due to an insufficient amount of open air and freedom, and to curtail this is only likely to make matters worse.

HOLIDAYS

Holidays are or should be intervals of rest and recreation from the eternal grind of the school curriculum. From the point of view of health they are very important, and were it not for such welcome breaks probably many more children would succumb to the pressure of the school work. With regard to the weekly holiday it is much better that this should be broken up into two half days, as is the custom in public schools, rather than have it all on one day. It makes more of a break, and is more in keeping with physiological principles. These intervals should not be frittered away in slackness, but there should always be some form of activity, whether it be a game or the pursuit of some hobby. The time as far as possible should be spent in the open air.

It is customary for school-children to get long holidays at stated intervals, and especially a very long time in the summer. There should really be no need for these prolonged breaks if the child is not subjected to pressure. Two or three weeks ought to be quite long enough as a period of relaxation from school work. There is no doubt, though, that as work is carried out at present, many children do require these long spells of freedom owing to the detrimental effect of school work on their physical and mental well-being. A striking proof of this is shown by the way in which children grow so much more during the holidays. It has been ascertained in Germany that at the age of sixteen years boys put on as much weight during the three months' holiday as during the nine months' term.

We think the only form of holiday task which should be set, should be the following out of some hobby, such for instance as collecting and pressing specimens of wild flowers, &c., but it should be optional.

EMPLOYMENT OF CHILDREN OUT OF SCHOOL

This is one of the biggest problems in relation to school work, at any rate in certain of the industrial centres, where young children have to enter factories and do a certain amount of work before or after they come to school. It must be obvious that they can do justice to neither, for if they go to the factory in the mornings they start at a very early hour, and after working all the morning have a hurried midday meal and come to school in the afternoon. The fatigue produced by the long hours of working in a hot atmosphere, which is often very moist—it is stated that the temperature is seldom below 75° and in hot weather is higher—must prevent a child from acquiring any benefit from his school teaching. This, apart altogether from the bad effect of such surroundings on a growing child. Measurements taken here have shown that there is a difference of about 1 inch in height and 2 to 3 lbs. in weight between those attending half-time and those who attend altogether.

Employment of children is general all over the country, and in most cases is carried out either before going to school in the mornings or in the dinner-hour or after school at nights. The kinds of occupation vary considerably. None of them need be harmful, but in our opinion some of them, as carried out, are distinctly so to the physical development. Many observers have noted a great degree of malnutrition and anæmia among such children; and certain deformities, such as curvature of the spine, are distinctly more common in some employments.

In our investigation into the subject during the past two years we have come to the conclusion that certain occupations, more particularly those which entail early rising, much hurrying with inadequate time for meals, or late retiring to rest, do undoubtedly affect the physique, as exhibited by the growth in height and weight. In carrying out our inquiry we have separated the boys into different classes, and the various measurements are given in the accompanying table.

	Not Employed.	Paper Boys.	Milk Boys.	Errand Boys.	House Boys.	Miscellaneous Employment.	Saturday Workers.
Numbers	696	197	75	145	135	84	98
Average height in inches	57·5	56	55·8	56·9	57·5	56·8	57·3
Average weight in lbs.	80·7	76·3	77·8	78·4	80·9	79·1	81·1

These occupations comprise those who take round papers in the mornings. They have to get up between 5 and 6 A.M. and seldom go to bed before 9 P.M. Others go round with milkcarts and deliver cans at houses. These boys get up still earlier, and often have to work between school sessions and afterwards. Others, again, come into the category of errand boys, and have to take round baskets of provisions or drapers' parcels, &c. Sometimes they have to carry heavy weights. Another section embraces those who are employed in the mornings at private houses to clean knives and boots, carry coals, and so forth. They are often provided with breakfast by their employers. These boys usually work under good conditions, and their general physique is up to the average of those not employed at all. The same may be said of those who work on Saturdays or Sundays only as golf caddies or errand boys. A further group consisted of those engaged in miscellaneous employments, whose numbers were too small to differentiate them into further sections, such as digging and weeding gardens, lathering in barbers' shops, &c. These latter often have to work for long hours in small rooms which are badly ventilated and often overcrowded.

The height and weight of those boys whose occupations result in their obtaining an inadequate amount of sleep is considerably below that of others.

To our mind this question of employment, as carried out at present, does produce a bad effect on the general physical welfare of the child. Consequently we think by-laws should be adopted by local authorities regulating the hours of work, &c., *i.e.* not permitting children below a certain age to engage in occupation for remuneration before a certain fixed time in the morning or after a fixed hour in the evening. Also there should be restrictions as to the weights to be carried. Local authorities have power to adopt such by-laws.

In the present condition of economics it seems to us that this employment of boys is necessary, and as far as we can see, if the work be regulated, there is no reason why it should be detrimental to health. It is the rush, the hurried meals and the insufficient amount of sleep which are the great drawbacks, but it ought to be possible to ensure that these need not be.

PREVENTION OF DISEASE

An important factor in fostering the health of the child is the prevention of disease. This is achieved by developing the child's resistive capacity to disease, as in a healthy state there is always a natural tendency to overcome any deleterious influence. But if the harmful influence is extremely infective or virulent, or if the dose of the poisonous agent is too great, then the defences break down and disease arises. So that of equal importance in considering the welfare of the child is the method of preventing disease by exercising control over the sources of the injurious agent. This method is most applicable in the case of infectious and other diseases due to germs, but is carried out continually in connection with efforts to check disease. Thus where certain articles of diet are found to produce diarrhœa, &c., the disuse of such is the surest way to the eradication of the trouble, and the avoidance in future of such constitutes this line of defence in the maintenance of a healthy condition.

In childhood the question crops up largely in connection with the infectious diseases. More particularly are we concerned here with its reference to school attendance and the risk of conveying the disease to others.

The congregating together of children from so many different homes in rooms, where they must necessarily come closely into contact with one another furnishes an easy way in which the disease may spread.

All children who contract any such complaint should stay away from school and be kept from contact with others.

All children coming from infected homes should be excluded until a certain quarantine time has elapsed after the last contact with the infected person. Exceptions to this rule may be made for older scholars in the case of measles, whooping-cough, German measles, chickenpox, and mumps where they themselves have previously had the disease.

The following table gives an idea of the length of time the child is infectious, the time at which he may resume attendance, and the period of exclusion for children coming in contact with the disease.

The reason why it is better to avoid returning to school at once after cessation of isolation in the case of diphtheria and scarlet fever is in order to prevent as far as possible any danger of persistence of infection through sore throats, &c.; and also because it gives the child an opportunity to regain some of his strength.

The times stated in the last column refer to the interval elapsing after the disinfection of the premises subsequent to the removal of the child to hospital. If the patient is treated at home and not properly isolated, the quarantine dates from the end of infection of the last case in the house to develop the disease.

Disease.	Duration of Infection.	Date of Resumption of School.	Quarantine of Contacts.
Diphtheria	3 to 4 weeks, often longer	4 weeks after freedom from infection	21 days from date of last exposure to infection.
Scarlet fever	6 to 8 weeks, sometimes longer	2 weeks after freedom from infection	14 days do.
Measles	3 to 4 weeks	4 weeks from appearance of rash	21 days do.
Whooping-cough	6 to 8 weeks	About 8 weeks —when cough has ceased	21 days do.
German measles	2 to 3 weeks	3 weeks from appearance of rash	21 days do.
Chickenpox	2 to 3 weeks —as long as scabs remain	When scabs have disappeared	18 days do.
Mumps	3 to 4 weeks	4 weeks	24 days do.

H. Maughan Brown, M.D.

HEALTH IN MATURITY AND OLD AGE

INTRODUCTION

The subject of Health has engaged the attention of thinkers all through the ages. The great Hebrew legislator, Moses, laid down most elaborate rules for its preservation, inculcating the importance of scrupulous cleanliness, the careful selection of articles of food and drinks, the periodic cleansing of dwellings, and the isolation of the sick; and it is to the observance of his laws that the remarkable exemption from periodic and other diseases which the Jews have enjoyed, is to be ascribed. Coming down to the time of the Greeks, we find Hippocrates, the "father of medicine," with a clear conception of the relation between food and exercise, and he was careful to point out the evil of excess. The six items as to which he considered strict regulation necessary for the maintenance of health were: air, food, exercise and rest, sleep and wakefulness, repletion and evacuation, the passions and affections of the mind. Later still we have Cicero telling the Romans that health is to be secured only by a knowledge of their constitutions, of what agrees with them and what disagrees, and by temperance in all things, especially in eating, drinking, and self-indulgence of every kind. And it is on these fundamental principles laid down by the sages of the past that the modern physician still bases his rules for a healthful life. Whatever the advances of human knowledge, these things remain established as essentials for all time, and they underlie the very latest methods indicated by the most advanced science of the present day.

GENERAL PRINCIPLES

"What a piece of work is man! how noble in reason! how infinite in faculties! in form and moving, how express and admirable! in action, how like an angel! in apprehension, how like a God! the beauty of the world! the paragon of animals!"

What is Health? The man in the street would probably reply: "Feeling well." His simple, obvious answer is, however, decidedly inaccurate, for a person may feel very well and yet actually be very ill. For example, a man may be feeling well and happy, indeed elated, and yet be the victim of such a mortal disease as "general paralysis of the insane." Health, then, implies something more than "feeling well," and before we are in a position to understand what it really means, we must know something of the structure and composition of the human body and what is needed for keeping it in proper working order.

All forms of animal life, from the lowest—a mere speck of formless jelly—up to man, are constructed on the same general principles and are obedient to the same fundamental laws.

They all nourish themselves, reproduce their like, and have certain relations with the external world. In the one case these functions are performed with the simplest possible apparatus; in the other the apparatus is complex in the extreme.

To begin with one of the lowest forms of animal life—the amœba.

The amœba, a single cell floating in sea-water, is, in common with all other animals, composed of an essential "life-stuff"—protoplasm, as scientists call it. By virtue of this protoplasm the amœba is endowed with many complex activities; for example, it generates heat, it wastes and repairs, it moves about, it reacts to the external stimuli, it reproduces its kind. It thus expends energy, and the expenditure involves renewal. How is renewal effected? What winds up the vital clock? The answer is, Food (and "food" includes water and oxygen).

This single cell probably represents the earliest form of animal life, and hence may be regarded as the original ancestor of man—who, as we shall see later on, is essentially a marine animal.

As we trace the animal creation through its long series of evolutionary changes from the amœba upwards, we find that ultimately, instead of a single cell, millions of cells go to compose the individual, the cells being arranged in various groups called *organs*, each organ subserving a particular function. Thus we have the organs for digestion (alimentary tract), respiration (lungs), circulation (heart and blood-vessels), for the transmission of nerve impulses (nervous system), and so on. By means of these organs there is brought about what has been termed the physiological division of labour, every group of cells having its allotted task. The simple and homogeneous has become the complex and heterogeneous.

The human body, then, is an organised cell-republic, each individual cell, though living its own life like the amœba, yet at the same time co-operating with all the other cells for the common good of the body as a whole.

All the cells of the body lie bathed in *lymph*, which is comparable to the sea-water in which the amœba lives, inasmuch as it is a salty fluid containing food-stuffs and oxygen; and just as the amœba takes from the water its food and oxygen, returning to it the waste products of its body, so does each cell of the human body take from the surrounding lymph its food and oxygen and return to it the waste.

What is this lymph? Before we can answer that question we must know something about "food." Taken in its broadest sense, food includes solids, fluids, and oxygen, and confining our attention for the present to the solids, we find the essentials of these to be: proteins, fats, starches, sugars, and salts.

These are passed through the mouth into the alimentary tube, and after digestion enter the blood. The blood is pumped by the heart into a series of tubes, known as *arteries*. These decrease in diameter until they become of very minute size. They are then known as *capillaries*. From the capillaries the nutrient materials of the blood ooze out into the lymph, which forms a vast irrigation-system between all the cells of the body. Inasmuch as this fluid contains much common salt, the body cells float in a kind of sea-water, and in this sense man, like his remotest ancestor, is a marine animal. Moreover, just as the health of the amœba may be said to depend upon the condition of the sea-water, so the health of man depends upon the condition of his lymph. If his lymph is pure, he is well; if his lymph is impure, he is unwell. This simple statement embodies the whole philosophy of health and disease.

To recapitulate: the cells of the body feed on the lymph, the lymph is replenished from the blood, and the blood takes its nutrient matter from the food which has been digested in the alimentary canal. Fluids as well as solids enter the blood from the alimentary canal, but oxygen—a very vital food—is taken from the air by the lungs. The potential, or stored-up, energy of these three things—solids, fluids, and oxygen, which are all included in the comprehensive word "food"—is ultimately converted by the cells of the body into the kinetic energy of heat, motion, and other activities. Of this more will be said under the head of metabolism (see "Food").

Reduced to simple terms, then, the body may be said to be compounded of two parts: (*a*) the cell, and (*b*) its surrounding lymph. Now the cell is a stable thing, and not liable to disease arising spontaneously within itself. It must follow, therefore, that what we call health and disease are conditions which depend upon the composition of the lymph. If the lymph is pure, the body-cells are healthy; if the lymph is impure, the body-cells are unhealthy. We are now in a position to define disease: it is *a condition created by the circulation of impurities in the lymph;* upon this simple truth the whole science of medicine is built up.

Lymph is impure when poisons are present in it. These poisons are derived from various sources. Some are the result of indigestion and constipation, others are due to such things as alcohol and lead, an immense number are produced by microbes.

These microbes play such an important rôle in disease that some brief notice must now be taken of them.

The term *microbe* is here used in the comprehensive sense to include all micro-organisms, such as bacteria, bacilli, germs, &c. Microbes cause disease by generating poisons, technically known as *toxins*, each kind of microbe having a toxin peculiar and distinct to itself. Just as the symptoms of aconite poisoning differ from those of belladonna poisoning, so the symptoms of one microbial disease differ from those of another microbial disease. Many microbes can be recognised under the microscope—as, for example, those of tuberculosis, pneumonia, diphtheria, typhoid, and cholera. Others are so excessively minute as to be invisible even under a microscope of the highest power, and inasmuch as these will pass through filters which arrest bacteria of ordinary size, they have been termed *filter-passers*. A good example of such is the microbe of yellow fever.

The power of the microbe to increase in number is remarkable; for instance, it has been been computed that a single cholera bacillus, if allowed absolutely free scope for reproduction, would give rise in twenty-four hours to 1600 trillions of its kind, forming a solid mass of one hundred tons!

Microbes are introduced into the human body by various channels. Most of them have a predilection for particular "ports of entry." Thus the microbe of scarlatina attacks through the throat, of measles through the nose and throat, of pneumonia by way of the lungs, and again, of enteric, cholera, and dysentery through the intestine. Some of the microbes are conveyed through the medium of air, and in this case they must be in the dried state. A good example of this kind is the bacillus of tubercle. Others, such as the microbe of cholera, rapidly die when deprived of water. The former are said to be "air-borne," and the latter "water-borne," or, put in another way, in the one case we breathe in the organism with the air, and in the other we swallow it in a liquid, such as water. It has now been established that certain people who have recovered from a particular disease can harbour the microbe that caused the disease for some time after recovery. Such persons are called "typhoid-carriers," "diphtheria-carriers," &c., as the case may be. As illustrating the importance of this matter, the specific microbe has been found in the urine, fæces and gall-bladder as late as ten years after recovery from an attack of typhoid. And not only so, but a person can carry about the microbes of a particular disease without having suffered from the disease himself. This has been proved in the case of germs of typhoid, diphtheria, pneumonia, and many other diseases. In fact, it may be laid down as a general principle that anyone can harbour and convey the germs of any disease without himself having had that disease.

In this connection reflect upon the following: the family cook, a "typhoid-carrier," after defecation smears her fingers. By neglecting scrupulously to wash her hands she conveys the specific germs of typhoid to plates, dishes, spoons, &c. In a similar way, a dairymaid can infect the milk.

Again, take the case of that harmless (?), necessary creature, the family cat. It has slept, we will say, in the dustbin, or, prowling about at night-time, it plays with a cat from some infected house. After so doing it may harbour in its fur millions of different microbes. Dear little Tommy then fondles it, and to everyone's amazement contracts diphtheria!

Ponder on this: after the age of thirty-five one in eight women and one in twelve men die from cancer. Mice are particularly liable to cancer. Although the cause of this disease is not as yet definitely settled, there are some reasons for thinking that it is due to a microbe. May not the cat convey this microbe from the mouse to the human being?

Another most potent source of infection is the ordinary house-fly. As a disease-carrier it has no equal, and mankind has no more persistent and deadly foe. It can lodge on its feet, proboscis, and intestines microbes innumerable, more particularly those of tuberculosis, typhoid, and cholera, and these it readily conveys to articles of food. Born in a dung-heap, ashpit, or house-refuse, and feeding on filth of various kinds, yet its presence is tolerated in the larder, kitchen, and eating-room. If we resolutely banned all restaurants where the house-fly is to be seen, means would soon be found for its extinction. Rigorous precautions should also be taken to prevent them from coming into contact with the sputa of consumptives, or with the evacuations from cases of typhoid, summer diarrhœa, and other intestinal disorders.

Except on the tops of very high mountains and far out at sea microbes exist everywhere in vast numbers. The human body, in fact, may be compared with a fort which is constantly invested by invisible foes ever ready to attack, and were it not provided with means of defence life would be impossible. But such means exist, and they are very remarkable. First among them, and guarding as it were, the "outworks," are the cells covering the external and internal surfaces of the body; so long as these remain healthy and intact, bacteria can rarely enter. Assuming, however, that a way has been forced beyond these "outworks" and entrance gained within the citadel, Nature has yet many weapons of defence at her disposal. The fixed or "stationary" cells of the body can destroy many kinds of microbes. Other cells, called "leucocytes" or "wandering" cells, float in vast numbers in the blood and lymph, and recognising in the microbe a foe to the cell-republic they scent it from afar, hunt, seize, and destroy it. To these defensive cells—whether fixed or wandering—Metchnikoff has given the name of *phagocyte* (Greek, *phagein*, to eat). "It is the phagocyte," he says, "which delivers us from our enemies. Sometimes the phagocytes devour at one swoop whole masses of bacteria." In other cases, the liquid of the blood and lymph possesses the power of dissolving microbes. Thus the body employs different means of defence according to the nature of the invading bacterium. For example, the tubercle bacillus is killed by the phagocytes, the microbe of cholera by the fluid of the blood and lymph.

Once, however, the bacterium has obtained an actual settlement in the body it undergoes rapid and myriad-fold multiplication therein, and manufactures vast quantities of its extremely poisonous toxin. It is to the circulation of this toxin in the blood that the symptoms of a bacterial disease are due.

So far we have discussed Nature's defence against the microbe: what is her defence against the deadly toxin?

She elaborates a neutralising substance called an *anti-toxin*, the antitoxin and the toxin together forming an inert chemical compound. The physician takes advantage of this knowledge in the treatment of many diseases. Take, for example, the modern treatment of diphtheria. A horse is infected with progressively increasing doses of the toxin of the bacillus of diphtheria. In course of time the blood of this horse is found to be rich in the antitoxin of diphtheria, and can be used in the treatment of a human being who is suffering from diphtheria.

The term *infection* is employed to denote that a disease is of bacterial origin.

Lowered Resistance of the Body to Infection.—Exposure to cold and wet, over-feeding, under-feeding, and improper feeding, alcoholism, fatigue, worry and anxiety, each and all can so depress the bodily functions as to predispose to attacks of bacterial infection.

Arguing on the basis that what applies, with certain limitations, to the lower animals equally applies to mankind, the following observations are of interest: the hen is naturally insusceptible to the bacterial disease, anthrax; when, however, its feet are immersed in cold water it will at once contract the disease, if infected. Rats, again, are ordinarily insusceptible to anthrax, but become susceptible after fatigue or when fed on a purely vegetable diet.

The moral, then, is to keep ourselves in every way "physically fit" if we wish to lessen the chances of contracting an infection.

FOOD

As the body is constantly expending energy, in order to keep the vital mechanism going fuel has to be supplied in the form of food, the potential energy of the food being transformed into the kinetic energy of heat, muscular contractions, thought-processes, and all those other manifestations of energy of which the human body is the seat.

If the intake of potential energy exactly balances the expenditure of kinetic energy, the body-weight remains stationary. Man is by nature a mixed feeder; that is, he is partly carnivorous and partly vegetarian. His food must contain proteins, fats, carbohydrates (starches and sugars), and salts (soda, potassium, iron, phosphorus, &c.). By digestion the nourishing elements of the food are extracted, and transformed into materials fitted for absorption into the blood. From the blood, these pass into the lymph, upon which the cells of the body feed.

The food is first of all broken up by mastication and mixed with saliva, which partially digests any starch it may contain. Passing from the mouth into the stomach, the meat-foods (ordinary meat, bacon, bird, fish, eggs, and the like) undergo an initial digestion—a preparation for full and complete digestion in the upper part of the intestines. After this preliminary digestion, the food enters the intestines, where all its various constituents of nutritive value are rendered fit for absorption into the blood. With the blood, they proceed to circulate through the liver, where certain finishing touches are put on them; this organ also acting as a kind of filter, freeing them from any impurities and neutralising any poisons which may have escaped from the intestines (the liver, indeed, is the great blood-purifier of the body). From the liver the blood, carrying with it all the products of digestion purified and rendered suitable for assimilation, circulates in every part of the system; and eventually the nutrient elements trickle out into the lymph—which irrigates all the cells of the body. From the lymph the various kinds of cells pick out such nourishment as each requires.

As just stated, all the food taken into the mouth (with the solitary exception of fat, which is absorbed in another way) after digestion, has to pass through the liver before it can be received into the general blood-circulation, and the same remark applies to all the fluids swallowed. If we take a glass of beer or whisky, for example, all of it has to percolate between the millions of cells of which this organ is composed. From this we can understand how it is that the liver is so liable to be upset by anything disagreeable to it.

After this preliminary survey, we will now take up certain points in detail.

Mastication.—During mastication the teeth grind the food so that it shall present, when swallowed, a greater surface to the action of the gastric juice. Moreover, the act of chewing has itself an important bearing on stomach-digestion, for during the chewing process the gastric juice begins to flow and the walls of the stomach to contract, so as to adapt that organ to the amount of food swallowed (when empty, the stomach is a flaccid bag). As Dr. Harry Campbell says, children should be taught from the first to masticate thoroughly, for the habit once acquired tends to persist through life. The more thorough the mastication, the greater the flow of saliva, and as the saliva digests starch, efficient mastication is an important aid to the digestion of farinaceous food. Further, when a proper amount of saliva is swallowed, the flow of gastric juice is stimulated.

From these conditions it is evident that a person who "bolts" his food must of necessity throw an undue share of work upon his stomach and intestines. For this reason, soft, pappy food, like milk puddings and porridge, which slip easily down the throat without being thoroughly acted on in the mouth, are often harmful, whereas hard, dry foods like biscuit, toast, or bread-crust are good, because they compel efficient mastication. If children are brought up mainly on soft foods the jaws cannot attain their normal size, and, as a result, the teeth are apt to be crowded and liable to early decay. "Adenoids" are probably caused by inadequate mastication during early life. Many other evils result from faulty mastication. One is that *too much food is eaten;* the longer the time spent on mastication, the less the desire to go on eating. Moreover, efficient mastication results in a more perfect digestion, and the needs of the system are sooner satisfied than when the food is bolted, for the nutrient elements are more easily extracted and more economically consumed. There is thus none of the morbid craving for food so common amongst dyspeptics. Horace Fletcher has found that by subjecting his food to thorough mastication he is able to subsist on a much smaller amount than is taken by the ordinary adult, and he discovered that on adopting this plan his health and vigour improved remarkably. In fact, he has literally chewed his way to health. "My head was clear, my body felt springy; I enjoyed walking; that tired feeling had gone." Moreover (and this is very significant) he found that his excreta became quite inodorous—a fact that suggests that under such circumstances no intestinal putrefaction occurs, and so the blood is kept free from poisons. When lumps of hard food, like new bread, hard-boiled eggs, lobster, suet-pudding, are swallowed, these substances, being little permeable to the gastric and intestinal secretions, are liable to undergo putrefaction, and in this way to set up various disorders, notably *appendicitis*—which is essentially a dietetic disease, occurring usually amongst those who eat too fast.

Again, in the case of farinaceous food (starches and sugars) efficient mastication is of paramount importance, for unless it is thoroughly acted on by the saliva, such food often sets up flatulent dyspepsia and leads to the production of toxins, which being absorbed into the blood bring about a general poisoning of the system. Primitive man had to search for his food, and usually had hard work to get it. When he obtained it he was hungry, and all the digestive juices were ready to receive it. Owing to the present artificial methods of existence, food is often thrown into the stomach as a sandwich into a bag. How can a person masticate properly when he is hurrying over a meal in order not to be late at the theatre? Again, take the case of a "dinner party": is it possible to masticate properly and at the same time carry on a spirited conversation with the lady at your side? Are you not thinking more of the epigrams you wish to startle her with than the food you are eating? When the mind is engrossed in other affairs than the taking of food the digestive secretions are apt to be scanty and indigestion liable to follow. If a person is mentally occupied he ought to refrain from eating, or eat very slowly.

Metabolism.—We saw, in our brief summary of the digestive process, that the "digested" part of the food is received into the blood to pass out into the lymph and ultimately to enter the cells of the body; these cells building up the dead food into the living organism. This assimilation of the food by the body-cell is known as constructive metabolism or *anabolism.* But side by side with this constructive metabolism the cell is yielding up its energy in the form of heat and in other ways, and there result—waste products: this waste-production constitutes destructive metabolism or *katabolism.* To put the matter in simple language, the body-cell is continuously undergoing waste and repair; the former is known as katabolism and the latter as anabolism; the sum of the two is metabolism.

Amount of Food.—The body-cells, then, are constantly undergoing a building-up process (anabolism), and a breaking-down process (katabolism), and, obviously the amount of food needed must bear a direct ratio to the extent of the latter.

Now, the rate of katabolism is determined by various factors, such as age, sex, size, idiosyncrasy, the amount of exercise taken, and the external temperature—for with a high temperature the loss of heat by the body is less as compared with the loss at a low temperature. It follows that all these factors go to decide the amount of food needed.

Age.—The period of growth is characterised by great katabolic activity, and as at the same time the body-cells are increasing in bulk, anabolism also is then at its highest. Hence a large supply of food is required during this period of life.

Up to the age of about forty katabolism remains much the same, but after this age and until the end of life, it progressively diminishes. The needful amount of food, then, is less after forty, and in extreme old age a very small amount suffices, especially if a steady external warmth of the body is maintained.

Sex.—Up to about puberty, katabolism is the same in both sexes; after that time the man is the more katabolic. For this reason, and on account of his larger stature, he requires more food than the woman.

Stature.—A person of big build requires more food than one of smaller size. Per unit of body-weight he requires less, because metabolic activity varies inversely with the body-weight, inasmuch as the less the weight the greater proportionately is the loss of heat. The mouse, for example, requires more food in proportion to its weight than the elephant.

Idiosyncrasy.—With some people the metabolic clock is regulated to go fast, in others slow. Certain persons always remain thin, however much they consume. The explanation must be that they possess great katabolic activity, *i.e.* they burn off their food more quickly than others.

Exercise.—Exercise has a marked influence on metabolism. Those who are engaged in muscular work are actively katabolic, and the food allowance must be regulated to the work done. A person lying quietly in bed requires comparatively little food. Those who eat in excess of their physiological requirements should take plenty of exercise in order to katabolise the excess. On the other hand, those who live a sedentary life can neutralise its otherwise bad effect by reducing their diet accordingly.

These remarks apply especially to middle and old age. Youth can take liberties, for the bodily mechanism can then deal with excess of food. Not so in maturer years; in middle and late life the fires are burning slow and the body-cells cannot adequately cope with excessive fuel.

A Sufficient Diet.—A sufficient diet may be defined as one which secures that the intake in the form of food (proteins, fats, starches, and sugars, with salts—soda, potassium, phosphorus, iron, &c.) so exactly balances the expenditure in the form of heat, muscular and mental activity, &c., that the weight remains constant—always, of course, premising that the person is in health and of proper weight.

But what, again, is proper weight? It may be described as the weight which experience in each individual case proves to be consonant with the feeling of well-being.

After middle age, a certain amount of fatness is not undesirable.

> "Let me have men about me that are fat,
> Sleek-headed men, and such as sleep o' nights.
> Yond Cassius hath a lean and hungry look;
> He thinks too much: such men are dangerous."

Actual Amount of Necessary Food.—The ordinary city man, taking but little exercise, requires about 30 oz. of food daily; a man doing a fair amount of muscular work needs about 48 oz. But allowance must be made for idiosyncrasy, for some people are more, and some less, katabolic, and again, as has already been pointed out, by thoroughly masticating and insalivating the food the energy of the body can be maintained, and its waste repaired on a smaller quantity of food than when mastication is less thorough.

Also, we live by what we *assimilate*, and not by what we swallow. In some people the digestive system is more perfect than in others, and those with sound digestions can extract more nourishment from their food than those with defective digestions. Good digestion means good blood, and good blood means good health.

Evils of an Excessive Diet.—The normal capacity of the stomach is about $1\frac{3}{4}$ pints, and one of the ill-effects of a too large meal is the over-distension of that organ. This, by pushing up the diaphragm, leads to embarrassment of the action of the heart and lungs. Again, if the intake of food is in excess of physiological needs, some of it may be passed out in the form of albumin and sugar by the kidneys (this is rare, except in the case of an actual surfeit), some—but a very small proportion—is stored up as fat, but the larger proportion has to be burnt off (katabolised) by the tissues, and the chief strain falls upon the muscles. But, as we have seen, an increased katabolism involves an increased output of waste-products, which means, again, more work for the excretory organs. This, however, is only part of the evil; we have to distinguish between the katabolism of a sufficient and the katabolism of an excessive diet, and the katabolism of an excessive diet is liable to lead to the production of poisons which may produce headache, giddiness, lassitude, drowsiness, depression of spirits, "nerves," irritability of temper, explosions of wrath, and in inveterate cases gout, and what is often vaguely termed rheumatism.

The evil effects of an excessive diet become chiefly manifest in middle and old age, for the reason that katabolism not only becomes progressively more sluggish with advancing years, but it is also less efficient—that is, instead of harmless waste-products being formed, poisons are liable to be generated which, by circulating in the system, impair the general health. In this connection it is to be noted that artificial teeth are not always an unmixed blessing, for they often conduce to an excessive consumption of food. One thing stands out clearly. *Those who attain to a healthy and happy old age are those who have been moderate eaters.* Cornaro, who lived to be ninety-eight, after a severe illness at the age of forty restricted himself to a daily allowance of 12 oz. of solid food and 14 oz. of light wine. Later in life he found he could support his life and strength with no more solid meat than an egg a day. At the age of eighty-three, he wrote his treatise on the "Sure and certain method of obtaining a long and healthy life."

Sir Tatton Sykes, who enjoyed remarkable health, and who recently died at the age of eighty-seven, in an interview two years before his death, said: "I eat very little after midday, only a trifle of soup and some pudding. I never take wine, but allow myself a wine-glassful of Scotch whisky in a pint of mineral water at one o'clock in the afternoon." There is now living a well-known nonogenarian who is actively engaged at his office from 9 A.M. to 5 P.M. He takes for his midday meal a few dry biscuits and a glass of milk. Edison, who works seventeen hours a day, enters his dining-room when the dessert is being served.

Vitamines.—Before leaving the subject of food it is necessary to say a few words about vitamines—new substances recently discovered and of high nutritional value, and in this connection we cannot do better than quote from a speech of Professor Leonard Hill at the last meeting of the British Association. "Food was supposed to contain a number of substances called vitamines. White bread did not contain these vitamines; in the milling process the outer layers of the wheat berry were removed and the vitamines taken away. That did not matter to people who got meat and eggs, but it did to people whose principal diet was bread. If one passed along the street one saw children having tea and white bread smeared with a jelly called jam. There were no vitamines present in that. If wholemeal bread or black bread were substituted they would have these vitamines. When the old controversy disturbed the political parties this question of the vitamines had not come up, otherwise the black bread would certainly have won the day; there was no argument about it. Sterilising of milk and the canning of food deprived such things, to a greater or less extent, of their vitamines."

Drinking at Meals.—With regard to this habit, it is now known that but little absorption of liquid takes place in the stomach. Moreover, the stomach has a muscular ring (sphincter) at its lower end, and nothing is allowed to pass on to the intestines until *all* the contents are reduced to a fluid state. Consequently, when fluids are taken with meals, instead of at once escaping into the intestines, as happens when they are taken on an empty stomach, they are retained, and so dilute the gastric juice, and in this manner they impair digestion. Further, liquids taken at meals facilitate the act of swallowing, and so conduce to inefficient mastication. None of the lower animals eat and drink at the same time. The practice is one of the pernicious conventions of civilisation. The moral, then, is that liquids should be taken on an empty stomach, say, half an hour before the meal. This is the practice we follow in giving a saline aperient the first thing in the morning.

We have seen that one of the chief results of over-eating is the production of poisons within the body. The poisons so generated, in addition to causing the functional derangements already indicated, may conduce to actual organic disease. Also, over-fed people have usually a lowered resistance to microbic invasions, and are therefore more liable to inflammations and diseases like erysipelas, bronchitis, and pneumonia, while their powers of recovery are greatly lessened. The mortality from pneumonia, for example, is greater among over-fed persons than among those who are habitually abstemious, and, again, the winter bronchitis of an elderly person can often be controlled by cutting down the food supply.

There is a Chinese proverb that runs: "Most men dig their graves with their teeth."

One of the great dangers of middle and of old age is high blood-pressure with hardening of the arteries, and this can often be held in check by careful attention to diet.

Fasting.—As with drinking, so with eating, it is from the continuous day-by-day excess when the organism is allowed no opportunity of recovering itself, that harm results rather than from occasional surfeits. One day's abstinence from meat per week means nearly ten years' abstinence by the age of seventy, and the accumulative good effects of such a fast are not to be lightly regarded.

Purgatives are often useful in counteracting the ill-effects of over-eating. A couple of grains of calomel at bed-time, followed by a saline in the morning, are to be recommended to the gourmand after over-indulgence. The beneficial effects of the annual visit to such places as Harrogate, Marienbad, Homburg, &c., are attributed to the course of waters taken there.

The Uric Acid Fetish.—A fetish is defined as "any object, animate or inanimate, natural or artificial, regarded by some uncivilised races with a feeling of awe, as having mysterious powers residing in it" (*Annandale's Dictionary*). According to some writers uric acid is responsible for nearly all the ills that flesh is heir to, and much literature has been devoted to the subject. But "'tis indeed a tale full of sound and fury, signifying nothing." In reality, uric acid is quite a harmless substance, and can be taken in large quantities without any ill effects. An infant at the breast may pass a lot of uric acid, and yet the mother's milk is a "purin-free" diet! An attack of gout may be brought on by swallowing a few glasses of Burgundy—which contains no uric acid, but not from sweetbread—which is rich in "purin-bodies"! There is no getting away from the fact that man is by nature a mixed feeder, and can eat almost anything in moderation *provided he chews it well*, and does not drink at meals.

General Conclusions on Diet.—Dr. Harry Campbell sums up the whole matter in a few pregnant sentences. "Simple in quality, and moderate in quantity. It should contain a certain proportion of animal food, say a third. All the starches and most raw vegetables require a great deal of chewing—hence they should be given in a form compelling mastication. Animal food requires less chewing. Guard against excess of sugar. The diet must not be monotonous. No fluids to be taken at meals."

OBESITY

There is a special tendency in some individuals to the accumulation of fat, and under conditions which, in ordinary people, lead to no such result. Excluding these cases, which are rare, the causes of obesity are: over-eating, the liberal use of alcohol, insufficient exercise, unnecessary prolongation of sleep. The matter thus resolves itself into a simple problem in arithmetic: an excessive amount of energising material is taken, a certain proportion of this is used up for the production of heat and work, the remainder is stored up as fat. It is very difficult to get people to realise this; it often happens that although a person thinks he is not eating too much, he is actually doing so. He forgets to allow for the changes in his habits now he is older, and for the diminished demands upon his system when growth has ceased and energy declining. The disadvantages of obesity are sufficiently obvious. People so afflicted generally become less able to work. They avoid exertion because they get "out of breath" so easily, and from a disinclination to exercise, their muscles tend to atrophy.

Another disadvantage is the dead weight of the extra fat that has to be carried about. Compare a young man of twenty-one, in good training, and physically "fit," and weighing, say, 11 stone, with the same man when he is sixty and weighing, perhaps, 16 stone. What an encumbrance this extra weight of 70 lbs. must be! Think what an extra tax is thrown on the heart and blood-vessels, and how the work of respiration is hampered! Even those who are only slightly above their normal weight, say one stone, often can be greatly benefited by having their weight reduced to the normal. This particularly applies to elderly people, whose heart and lungs are working to the utmost limit of their powers. When bronchitis occurs in elderly people, it is, in a large number of cases, induced, and always made worse, by over-indulgence. High blood-tension—that condition responsible for so many deaths from "heart failure" and "apoplexy"—is, as previously stated, in a large number of cases caused by the excessive administration of nourishment, and here it is of paramount importance to limit the food to the barest physiological necessity.

For the reduction of obesity the food-supply must be cut down both in amount and in choice. Starches, sugar, and fat must be religiously eschewed (saccharin can be used as a "sweetener"). Milk should be avoided. Pork, goose, duck, salmon, mackerel, and herring are to be forbidden. Toast must replace bread. Potatoes are banned, but green vegetables and fruits can be taken in abundance, for not only are they non-fattening, but by their bulk cause a satisfying sensation of repletion. Limitation of fluid is not necessary, but alcohol must be forbidden.

Various dietetic schemes have been recommended for the reduction of corpulence. Dr. Galisch, a German physician, arguing on the assumption that it is the hearty evening meal followed by the long repose of the night which is the main factor in causing obesity, gives the following directions, which, if followed with absolute regularity, will cause a loss of weight of from one to two pounds per week—and this without any disturbance of the vital powers: A cup of tea with bread and butter in the morning. If too hungry to wait for the midday meal, an egg with a slice of bread and butter at ten. At one o'clock a meal composed of meat, cooked vegetables, salad, and some stewed fruit. At tea-time, a cup of coffee with a biscuit, or a slice of bread and butter. In the evening, all he is allowed is one slice of bread and butter. For the first few days the patient may complain of a disagreeable feeling of hunger, but this soon passes off. As soon as the patient has returned to his normal weight, he is allowed more latitude with respect to the evening meal. But he must weigh himself at regular intervals, and must resume the prescribed dietary as soon as a tendency to put on flesh is manifested.

Exercise of course, should be taken. Gentle hill-climbing is good for those afflicted with a "corporation." Riding is of little service. "It is the horse that gets thin, not the man" is an old and true saying. Probably, by creating an appetite, this form of exercise does harm rather than good.

ALCOHOL, TEA, COFFEE, AND TOBACCO

> "Though I look old, yet I am strong and lusty;
> For in my youth I never did apply
> Hot and rebellious liquors in my blood.
> Therefore my age is as a lusty winter,
> Frosty, but kindly."

The effect of alcohol on the system has been a subject of much controversy. According to the researches of Kraepelin, alcohol, even in a small quantity, has a special affinity for the higher brain-cells, and once it has reached them through the blood its action is to lower the capacity for work, to increase excitability, to lessen the power of attention, and to diminish the will-power. It also affects both the judgment and the power of self-control, and when a person is under its influence, he is on a lower mental plane.

Taken in larger quantities, alcohol increases the liability to disease, weakens the powers to resist microbic infections, and lessens the chances of recovery when such infections are established in the system. Alcoholics, for example, are more liable than non-alcoholics to contract pneumonia (a microbic infection) and less likely to recover from it. And the explanation is simple. In a previous chapter it has been explained that one of the chief agents in the body's resistance to disease are those remarkable cells termed "phagocytes"—whose mission it is to hunt, seize, and kill the invading microbe. Now alcohol tends to paralyse the phagocyte, so when you ask a friend to have a glass of whisky, you are, in reality, asking him to have a glass of phagocyte-paralyser!

Although one may think he drinks but little, consider this: two glasses of whisky a day means 800 bottles in ten years—all of which has to pass through the liver. The testimony of army surgeons is emphatic, that drinking is the great source of all crime, illness, and insubordination. When debarred from drink the men are not only better behaved, but are more cheerful, less irritable, and endure better the perils and hardships of war. Take the following examples selected at random: In the memorable siege of Gibraltar (1779–1783) Sir George Elliott, who was a teetotaller, enforced the most rigid temperance, and the long and arduous blockade was passed through with remarkably little sickness. Again, in the Kaffir War of 1852, 200 men marched from Grahamstown to Bloemfontein and back, 1000 miles being covered in seventy-one days. The men were almost naked, were exposed to great variations of temperature (excessive heat during the day, while at night the water froze in a tent, with twenty-one men sleeping in it); and got as rations only biscuit and what game they could kill. *For drink they had nothing but water.* Yet this rapid and laborious march was not only performed easily, but the men were more healthy than ever they had been before, and after the first few days ceased to care about spirits. No man was sick until the end of the march, when two men got dysentery, and these were the only two who had the chance of getting any liquor. Take the tables worked out by insurance companies:

A temperate person's chance of living is—	An intemperate person's chance of living is—
At 20=44·2	At 20=15·6
30=36·5	30=13·8
40=28·8	40=11·6
50=21·25	50=10·8
60=14·285	60= 8·9

As a word-picture the following account (by the late Dr. Moxon, of Guy's Hospital) of the changes which chronic alcoholism produces in the body, is unsurpassed: "When the sot has descended through his chosen course of imbecility or dropsy to the dead-house, Morbid Anatomy is ready to receive him—knows him well. At the post-mortem she would say: 'Liver hard and nodulated; brain dense and small, its coverings thick.' And if you would listen to her unattractive but interesting tale, she would trace throughout the sot's body a series of changes, which leave unaltered no part of him worth speaking of. She would tell you that the once delicate, filmy texture which, when he was young, had surrounded like a pure atmosphere every fibre and tube of his mechanism, making him lithe and supple, has now become rather a dense fog than a pure atmosphere—dense stuff which, instead of lubricating, has closed in upon and crushed out of existence more and more of the fibres and tubes, especially in the brain and liver—whence the imbecility and the dropsy."

Most emphatically, alcohol should never be allowed to children. A liking for it acquired during the period of adolescence is responsible for most of the cases of incurable "dipsomania." Neither should alcohol be permitted to those of a nervous, excitable, or emotional temperament. It is an old and very apt saying, that alcohol "finds you out" when you have turned forty, and it is owing to this that so many careers are wrecked after that age. As soon as a man finds his judgment becoming impaired, his power of initiation lost, and his business acumen lessened, he should at once give up the use of alcohol for good.

> "Refrain to-night,
> And that shall lend a kind of easiness
> To the next abstinence; the next more easy;
> For use almost can change the stamp of nature."

Tea and Coffee.—Apart from the water, milk, and sugar, there is no actual nourishing material contained in tea or coffee. The "active principle" of both is what is technically called an alkaloid—a substance allied to uric acid. In other words it is a drug. There is no evidence that properly-infused tea or coffee does harm to grown-up people, assuming it is taken in moderation. It refreshes and clears the head—so it is said, but it is doubtful if the same result would not be achieved by taking a cup of hot water (especially if given in a darkened room, so that the individual did not know what he was drinking!) Being a drug, and *per se* containing no nourishment, it certainly should not be given to children. Why habitually administer a drug to the growing tissues of a child? Physicians tell us that the rising generation is neurotic. May not the modern convention of giving tea and coffee to children be largely responsible for this? Human nature has not as yet learned to live according to Nature's laws.

Tobacco.—Until the body is fully developed, say up to the age of twenty-four, tobacco should be tabooed. The growth of the body is largely determined by the secretions of certain glands. Tobacco tends to dry up these secretions, and in this way, as Sir Lauder Brunton suggests, its action is to retard the growth of the individual.

In the case of adults tobacco is probably harmless, always assuming it is not indulged in to excess. Personal idiosyncrasy plays an important part. Some people can only smoke the very mildest tobacco; others prefer it strong. The danger-signal is "palpitation of the heart," or intermission of the pulse.

Carlyle and Tennyson were both large smokers and lived to be well over eighty. The author knows of the case of a man who for seventy years smoked 4 oz. of "shag" a week, and died at the age of ninety.

The "pipe" is the most wholesome form of smoking, then cigars, then cigarettes.

FRESH AIR, SUNSHINE, HOUSES, VENTILATION

> "Where the sun does not enter the doctor does."—
> *Italian Proverb.*

Man is by nature an open-air animal. We see that he must be when we reflect that for many thousands of years his ancestors lived in the open, taking cover only for protection from weather, floods, or foes.

As a factor influencing health, the condition of the air that surrounds us is of supreme importance. The essentials of a good air are: that it is free from microbes and other impurities; that it does not contain too much aqueous vapour; that it is not stagnant.

The action of the sun is very potent in keeping the air pure, for it not only assists in the oxidation of impurities, but *it is a deadly foe to the microbe.* Microbes love darkness, dampness, and foul, stagnant air. No microbe can long survive a prolonged exposure to the direct rays of the sun.

The main distinction between indoor and outdoor air is that the latter diffuses freely, and is saturated with sunlight, while the former tends to be stagnant and receives but little sunlight. Consequently, microbes tend to flourish in indoor air, and this explains why infections are more often caught in a house than outside. If it be objected that infectious diseases are common in the country it is to be noted that the cottages there are generally badly constructed, and as a witty person once remarked: "The air in the country is always good, for the residents keep all the bad air shut up in their rooms."

The collection of a large number of people under one roof is always risky to health, largely because some of those present may be suffering from various communicable diseases, while others may be "infection-carriers." Theatres, music-halls, cinematograph shows, and such-like places, are hot-beds of infection, for by the very necessity of their construction they cannot adequately be flushed with fresh air or flooded with sunshine. By sneezing, coughing, and singing the air of the room may be infected to an extraordinary extent.

Read what Professor Leonard Hill says in a recent issue of the *Lancet* (10th May 1913):

"The other day there was a case that came under Professor Bulloch's notice—a man with acute pneumonia, who traced back his infection to a company meeting at which the secretary present had a cold. With streaming eyes and sneezing continually, this secretary appeared to be at the height of an infectious cold. At this same company meeting there was one man who got pneumonia and died. There was another man who caught a cold, which affected his ears, so that his tympanum was opened and the pneumococcus was found. The third man, who came under Professor Bulloch's care, was a typical case of pneumococcic infection. It is quite clear those three men were infected at that meeting by the spray sent out into the air by the secretary, who was expounding the business of the meeting. This spray infection cannot be prevented very easily if people are going to cough and talk and sneeze and go about among the company in crowded rooms with these infectious colds. Any infectious cold may be a pneumococcic cold. There are very many persons who are walking about with hardly any symptoms of disease, but whose saliva is teeming with tubercle bacilli. I remember the case of a young woman in perfect health apparently. She complained of a little cold, she was hoarse for singing; could something be done to prevent that hoarseness? Profesor Bulloch examined her sputum and found it swarming with tubercle bacteria. This woman was spraying the bacteria into the room whenever she spoke, sang, or coughed. She went about her business and made a complete recovery. The only way we can prevent spray infection is by keeping people in acute infective states isolated, keeping them away, making them stop at home, or by teaching them to sneeze and cough always into a handkerchief, and if they are speaking we can induce them to speak with a newspaper held in front of their mouths which would catch all the spray quite effectively; or, if we want to protect ourselves against such a person, we could casually hold a paper in front of our mouths without being rude. In that way, by such simple means, I believe that infection from these colds, which cause so much misery and discomfort, might be limited to a large extent. If people could all be trained, when they get into a state of acute infection with catarrh of the nose, to cough and sneeze into handkerchiefs and to speak with a newspaper held in front of their mouths, or at least to keep at home if they are not content to do that, that would prevent the spread of these infections."

Pre-eminent amongst the diseases fostered by an indoor life is tuberculosis. In England and Wales over 50,000 people die annually from it, this disease accounting for one in seven of *all* deaths. Think of the appalling mortality that once obtained amongst the picked men of our Foot Guards from tuberculosis, and then reflect upon the sudden fall in the rate after Professor Parkes insisted upon more spacious and better-ventilated barracks! In this connection mention should be made of the inadvisability of living in old houses unless these are thoroughly modernised. In their construction hardly any of the requirements of hygiene are met. The window-spaces are too small, sun and fresh air cannot penetrate into the dark, damp recesses, corners, and passages, and the old wood-work provides am excellent breeding-ground for microbes. When it is said that consumption runs in certain families, how often the true explanation is that the said families inhabit the same microbe-laden old houses from generation to generation!

The house should have a south-east aspect—that is, the most important sitting and bedrooms should face this direction, for in this way they get the maximum of sunshine the year round. *The sick-room should be the sunniest room in the house.*

The houses in a street running east and west obtain more sunshine than those in a street running north and south.

In towns the houses should be low, for they then do not deprive one another of sunlight. Trees adjacent to a house should be small, with scanty foliage, so as not to screen the house from sun and air.

There is another Italian proverb that runs: "He who plants a tree in front of his dwelling digs his own grave."

The windows should be made to open at the top, and should be placed at opposite sides of a room, so as to secure "cross ventilation." If this is impracticable, the window should be so arranged with respect to the door, that a free draught of air passes between them. In this way stagnant air—that excellent nursery of microbes—is avoided. Further, Professor Leonard Hill has shown that it is not deficiency of oxygen, nor excess of carbonic acid, which renders the air of a room "stuffy," but the fact of it being stagnant. According to him, it is *moving* air which is so necessary to health, and this on account of its action through the skin. Moving air, by exciting the cutaneous nerves, stimulates the nervous system, and in this way reflexly improves the general metabolism of the entire body. *Stagnant air, then, is the great enemy of health.*

Cubic capacity has little bearing on ventilation. A well-constructed small room is more healthy than a badly-constructed large room. *The main thing is to keep the air of a room constantly on the move.* The outside wind is the best of all ventilators. Air moving at the rate of about two miles an hour (practically imperceptible), and allowed to pass freely through a space 20 feet wide, changes the air in one hour 528 times! And when we reflect that the average movement of air in our country varies from six to twelve miles per hour, we can realise the good effects of opening the windows. The temperature of an ordinary living room should never be allowed to rise above 65° F., and the air should be kept as much as possible free from moisture. Air moving, saturated with sunlight, and dry, constitutes the ideal air.

The popular opinion that night air is injurious is what Captain Marryat would call flapdoodle—the stuff they feed fools on. Night air is just as pure and wholesome as day air, and in many towns purer and more wholesome, since so many of the processes which defile it during the day are discontinued during the night.

It is important to note that bedrooms receive a considerable quota of air, generally impure, from the rest of the house, especially from the landings, staircases and lower rooms. Therefore, the windows of the lower rooms and the hall-door should be opened for a time every night before the household goes to bed. During the day all bedroom windows should remain wide open for as long as possible, in order that the bedclothes (do not "make the beds" too soon!), walls, ceilings, and floors may be well flushed with fresh air, and the foul air, which has been stagnating in corners and recesses, removed. It is needless to add that there should be a minimum of carpets, curtains, furniture, knick-knacks, and the like, for these are mere microbe- and dust-traps. It is often a difficult matter to get people to comprehend all this, but then—"fools perish for want of knowledge."

The Railway Carriage Window.—"There is hardly a more dangerous atmosphere than that of a railway carriage. I have examined twenty-four samples of dust and air taken from railway carriages and have found germs of consumption, pneumonia, erysipelas, abscesses and boils, influenza, and catarrh. Cold and catarrh after a railway journey are not often due, as people imagine, to a draught, but to the atmosphere of the compartment." (Report of the Medical Officer of Deptford.)

CLOTHES

Bodily Temperature.—The heat of the body is supplied by the chemical changes (metabolism) which take place in the tissues, the muscles contributing by far the largest share. While heat is constantly being produced it is also constantly being lost, chiefly through the skin and lungs. The production and loss of heat are controlled by the nervous system, the action of which is such that there is a perfect adjustment between heat-production and heat-loss, the normal temperature remaining constant at 98·6° F. Thus, for example, exercise increases the heat-production, but, through nervous influence the blood-vessels of the skin dilate, and sweat is poured out in greater quantity through the skin glands, so that the increased heat-production is exactly balanced by increased heat-loss.

Exposure to cold implies greater heat-loss; this is met by a correspondingly increased demand for food (90 per cent. of our food goes to produce heat), hence more food is required in cold than in warm weather, and vice versa.

"The facts of aboriginal life seem to indicate that dress is developed out of decorations" (Herbert Spencer). Primeval man, living in the tropics, first of all painted himself, then he wore fringes and pendants of various sorts around his neck, waist, wrists, and ankles. At a later period he invented the loin-cloth. Then, pushing or being pushed into colder climates in search of food, the loin-cloth became lengthened into the kilt, and a sort of blanket adopted for the protection of the shoulders and trunk. Afterwards, with the dawn of a higher intelligence, sleeves and trousers made their appearance.

In clothing, the two objects aimed at are lightness and looseness. There should be a minimum of weight on the shoulders and chest, and sufficient looseness to admit of the fullest possible chest expansion—that is, to say, the measurements should be taken, not while the chest is in a state of mean expansion, but during extreme inspiration. It is scarcely necessary to say that these requirements are practically never complied with!

Corsets and Tight Lacing.—A witty person once remarked that corsets, cannons, and cooks claim about an equal number of victims. Even the most pliant and loose stays, though permitting ordinary breathing, prevent full chest expansion, and ordinary stays are practically always tightened up somewhat—their very name implies this—and they are decidedly tight to many who would not be regarded as tight-lacers. As a matter of fact, the chest of all corset wearers is distorted, the lower part of the chest being unduly contracted and immobile, and the upper part unduly expanded and mobile; so that no woman who has habitually worn stays can be employed as an undraped model. Stays also induce atrophy of the muscles of the back, chest, and anterior abdominal walls, and it is largely on this account that "pendulous belly," with its many evils, is so common in women after a certain age.

Collars and Shirts should be soft and flexible, for not only are such more comfortable, but they do not hamper the respiratory movements—a matter of considerable importance in heart and lung diseases.

The various garments, as previously stated, should hang loosely. The objection to closely-fitting garments is that they tend to set up "skin suffocation," *i.e.* the proper ventilation of the skin is checked, and the poisonous matters which should constantly pass out from it are retained in the system. Moreover (and this is an important consideration with respect to one's feelings), the skin loses the refreshing and exhilarating influence of moving air.

Materials in Common Use for Clothes.—**Cotton** is very non-absorbent of water, does not shrink in washing, conducts heat less rapidly than linen, but much more rapidly than wool. It is cheap and very durable.

Linen is also non-absorbent of water, does not shrink in washing, conducts heat slightly more than cotton, and is smoother.

Wool is a great absorber of water, the water penetrating into the fibres and distending them, and also lies between them. This property of wool is a most important one with regard to perspiration. Being a bad conductor of heat, it keeps the body warm. It shrinks in washing, and so after prolonged use, the fibres become harder and less absorbent, and its value as an article of clothing deteriorates. Its texture should be close, and the surface smooth and soft. It should be worn for all underclothing.

Hats.—Nature provides us with a hat in the form of an abundant thatch of hair. It is no more necessary to wear an artificial covering for the head (except to shield from the rays of a blazing sun) than it is for the forehead, face, and neck.

That man can dispense with a hat to his advantage is proved by the experience of the Blue-coat boys, as also by the many men who play golf without a hat. It is astonishing the great discomfort that will be submitted to for the sake of conformity! However, since "custom does make dotards of us all," hats when worn should be light and of soft material, and of loose fit, so as to allow of free ventilation to the roots of the hair. Hard-rimmed hats should never be used. They compress the blood-vessels, interfere with the proper nutrition of the scalp, and so induce baldness—which means not only loss of hair, but actual atrophy of the scalp itself.

Boots.—The human foot is composed of a number of complex curves beautifully adapted for the balance and carriage of the body, and for bearing the strain of walking, running, and jumping. Being elastic, it spreads out when receiving the weight of the body, becoming both wider and longer. Bearing this in mind, it is obvious that boots should be so constructed as to allow of the natural expansion when standing—the feet must never be subject to any cramping influence. Heels should be low, for if high they not only drive the toes into the front part of the boot, but alter the position of the centre of gravity of the whole body, the result being that a strain is thrown upon the muscles of the small of the back, which means not only general discomfort, but often entails "back-ache"—which ranks next in importance to headache as the commonest pain from which the body suffers. Moreover, badly-fitting boots are largely responsible for the difficulty in getting people to take the proper amount of exercise.

ON CATCHING COLD

It is well known that certain diseases like pneumonia, rheumatic fever, "colds in the head," may be acquired by sitting in a draught, getting wet through, or sleeping in a damp bed. It is now established that these diseases are due to microbes. In many cases the microbes travel from person to person by the spray of the saliva. During quiet breathing, the expired air is almost sterile. But if we sneeze, or cough, or sing, then the expired air discharges a spray of saliva that can reach a long distance off, and so infect any one standing near, who happened to have his mouth open at the time. But, then, what part does "cold" play in the transaction? Evidently by lowering the resistance of the body to bacterial infection, as explained in a former chapter.

Another important factor in these cases is that when the skin is cold and bloodless, its action as an eliminator of waste products is interfered with. This explanation is rendered the more probable by the fact that a chill is specially liable to excite disease *when the body is exhausted by fatigue*—at which time the body is loaded with waste products; and by the further fact that the best way to obviate the effect of a chill is to secure free action of the skin by a hot bath, followed by wrapping up in warm clothing. In severe cases, a purge—as an eliminator of waste products—is a useful adjunct.

EXERCISE AND REST

The muscles constitute about half the body-weight. The energy they liberate is in part manifested in "heat" and in part "work." Besides ordinary walking, &c., by means of muscle the circulation of the blood is carried on, and respiration and the movements of the stomach and intestine are effected. It must not be supposed that it is only when contracting—*i.e.* when voluntarily engaged—that muscles liberate energy. Even when at rest they are continuously producing heat; and, indeed, it is mainly through the heat they produce that body-temperature is maintained. The muscles, then, being the chief furnace of the body, it can be understood that any excess of nutrient material in the blood must be burnt off by them. So that if a person eats too much and the blood becomes surcharged with nutriment, one of two things must happen: either the extra amount is stored up as fat, or it is burnt off by the muscles.

Inasmuch as when contracting the muscles use up more nutriment than when at rest, the importance of exercise can be realised. The practical deduction to be drawn is that we should only eat in accordance with the physiological requirements of the body. Those passing sedentary lives require less food than those leading active lives. And another consideration enters here. It is probable that the "burning off" of excessive nutriment by the muscles is more sluggish, *i.e.* less efficient in the case of the sedentary than of the active, and as a consequence, poisonous material can enter the circulation and so to give rise to various manifestations of ill-health, ranging from mere lassitude and headache to gout, rheumatism, and other allied disorders. Exercise, then, not only makes metabolism more active and thorough, but it stimulates and assists the circulation of the blood, and efficiently flushes the secretory organs (skin and kidneys) so that waste products can be more readily eliminated. Last, but not least, it stirs up the liver—the chief organ for purifying the blood.

Horse-exercise is particularly good for the liver and abdominal organs, as also for the heart and lungs—hence the aphorism, "The best thing for the inside of a man is the outside of a horse."

The good effect of such exercises as horse-riding, cycling, and games like golf, is demonstrated by the fact that they not only remove the feeling of languor, but replace it by one of exhilaration. The explanation is simple; the languor is due to an accumulation of poisonous products in the system, and the exercise, by accelerating the flow of blood and lymph and stimulating the excretory glands, causes these poisons to be rapidly eliminated. In the case of people suffering from nervous exhaustion, or brain-fag, the exercise should be of a gentle kind —walking at the accustomed pace, or slow cycling. For the listless and lethargic fencing is to be recommended.

The Evils of Excessive Exercise.—In connection with exercise, it must always be remembered that man is not built for great physical strength. A donkey can do more work in a day than a dozen strong men. The so-called "strong man" is no good for continuous work. Let him compete with a navvy and see who tires first. The ancient Greek sculptors understood this; Phidias, Polycleitus, Praxiteles, Scopas, Lysippus, never gave their statues huge, clumsy muscles. You may object, and say, "What about the Farnese Hercules?" But the Farnese Hercules was of the Græco-Roman period—the period of decadence. Similarly also with regard to running; being built upon a vertical axis, man, proud man! would cut but a sorry figure in running a race with a rabbit—built upon a horizontal axis. It is needless to say that the Marathon races are a physiological absurdity. The heart and blood-vessels are specially liable to be injured by all such violent exercises, and the danger is greatest during adult life and onwards. The same remarks apply with equal force to rowing in races. In former times rowing was a very necessary accomplishment, but in these days of mechanical contrivances of what use is it? Nearly every member of a racing crew, after a severe contest, is found to pass albumen. In connection with useless exercises one is reminded of the remark of Dr. Johnson when asked to admire the spectacle of a dog dancing on its hind legs: "The wonder is not how he does it, but why the dog wants to do it."

The Sedentary Life: its Evils.—We meet with people who appear to be in good health, though leading an inactive life. Those who live at high mental pressure generally learn to husband their physical energy, but doubtless here the individual would be in better health if he used his brain less and his muscles more: he would certainly live longer. But even in this case there is an element of fallacy, for a person leading a sedentary life may yet stand on his feet a good deal, run upstairs frequently, and talk a lot (which means increased respiratory movements). Another consideration is that a person leading a sedentary life probably limits his diet to his requirements; if he does not he ought to, for he requires half the quantity as compared with the person leading a life of great muscular activity. Finally, it must be realised that the evils arising from a sedentary life may be unnoticed until the day of reckoning comes with its heart failure, apoplexy, winter cough, kidney disease, &c.

The movements of the chest are generally shallow in those leading inactive lives, and in course of time the thorax, in consequence, tends to become fixed and rigid. This not only causes improper breathing and increases the work of the heart, but it predisposes to all those bronchial troubles which are so common among the elderly during winter time. Another evil effect of a sedentary life is that the abdominal muscles tend to atrophy. The function of these muscles is to exert pressure upon the abdominal contents, and when atrophied they become flaccid and so can no longer exert this pressure. The result is a downward displacement of the organs contained within the abdomen. Moreover, the relaxed abdominal walls allow of an undue accumulation of blood in the vessels of the abdomen, and this may cause a feeling of "faintness" in some people.

Rules for Exercise.—The action of the chest must be free and unhampered, hence the dress should be planned in reference to this. As during exercise more oxygen is required and more carbonic acid is excreted than during rest, an abundance of fresh air is necessary—a circumstance often overlooked in such places as gymnasia.

There is little risk of "chill" while taking exercise, but afterwards there is great danger, and therefore extra wraps should be provided when it ceases. Alcohol is hurtful during exercise, for it lessens the excretion of carbonic acid. It is not possible to lay down absolute rules to meet all cases, but as a general principle it may be said, in reference to the ordinary man, that he ought to walk about eight miles (or its equivalent in some other form of exercise) to keep himself "fit."

Exercise should never be carried to the point of fatigue, exhaustion, breathlessness, or palpitation of the heart.

All sudden and violent effort should be avoided, for fear of injury to the heart and blood-vessels. This admonition especially applies to people over forty. Walking, golfing, moderate cycling, and gentle riding are the exercises *par excellence* for the middle-aged and the elderly. The elderly should not over-exert themselves when hunting and shooting.

Sex.—Up to the period of puberty boys and girls are practically the same with respect to metabolism, and a girl can be allowed to take almost the same amount of exercise as the boy. When the girl-child is transformed into the young woman her metabolism changes, there is an increasing tendency to the laying up of fat and to the storing of energy; she is now more anabolic and less katabolic—in preparation for the functions which pertain to her sex. For these reasons, exercise is less imperative for women than for men, and at certain times should be discontinued.

For the too fat person plenty of exercise should be prescribed, so as to burn off the superfluous adipose tissue. Care must be taken not to impose a strain on the heart.

For the too thin person, the amount of exercise should be very moderate, and in extreme cases exercise should be vetoed altogether.

Exercise is also detrimental in anæmia, except in extreme moderation.

Exercise with Respect to the Amount of Food.—Under ordinary circumstances the greater the amount of food taken, the greater should be the amount of exercise; and *per contra*, on a spare diet the exercise should be proportionately less.

A person undergoing prolonged muscular exertion should be well fed. He requires plenty of meat, fat, and sugar. Alcohol is at such times very hurtful.

Precautions with regard to Exercise in Diseases of the Heart, Lungs, and Kidneys.—All moderate exercise is beneficial in heart disease (assuming the disease is not "active"), provided no palpitation or breathlessness is induced. Of course, sudden violent exertion must be studiously avoided.

In acute diseases of the lungs absolute rest is imperative, and in chronic affections of these organs, only very moderate exercise must be allowed. Breathlessness is the "danger-signal" in all these cases. In ordinary asthma, however, exercise to the extent of breathlessness is often of advantage.

Those who suffer from Bright's disease should have their exercise strictly limited, for it increases the amount of albumen, overtaxes the already burdened heart, and throws a strain upon the arteries.

For those who for various reasons are unable to indulge in the proper amount of exercise, or for indolent persons whose muscles are overloaded with the products of incomplete metabolism, *massage* is an excellent substitute. (See "Massage.")

Rest.—Go to a museum and look at the statue of Hermes (it will only be a copy, the original is at Olympia). It is, perhaps, the grandest representation in sculpture of manly strength and manly beauty. The god is on his way to the nymphs and has stopped to rest. Notice the relaxed attitude of the figure, and observe how the whole body falls into a graceful curve—the "Praxitelean curve." This is the position of proper muscular relaxation. Many people, though able to keep still, cannot relax their muscles completely. Rest, to be effective, requires relaxation of the muscles to their utmost. Short of lying in bed, a sofa, or comfortable arm-chair *with the legs raised* on a support, affords the best opportunity for adequate rest. People who are tired should always adopt this plan, which, moreover, possesses the added advantage of relieving the heart of some of its work, the circulation being less under the influence of gravity. It is often advisable for a man who has been working hard all day to have his dinner while lying down, as the circulation of the blood is then more tranquil as compared with the sitting posture. The Greeks of old time understood this, for it was their custom to be resting on the elbow during a meal.

It is important for people going on their holiday to be cautioned against over-exertion. Paterfamilias, for example, leading a more or less sedentary life for eleven months, goes on his annual holiday. Exhilarated by the fresh air and novel surroundings, he is disposed "to rush at things." The result may be a strain on his heart, the effect of which will be permanent though it may not be noticeable for years. Nature is a strict accountant. She never forgets, and rarely forgives. The moral is that exercise under these circumstances should be of a gentle character at first, and as the system becomes tuned up, it can be indulged in more vigorously.

WORK AND PLAY

Primitive man led, and wherever he still exists, still leads, an active, outdoor life. The struggle for existence—the search for food, the battling with foes, the ardour of the chase, with the weird dances, the fantastic ceremonials, the Bacchanalian orgies that diversified his leisure—all imply emotional excitement.

Civilised man still retains in his blood a craving for pleasurable excitement, and, if he is to remain healthy in mind and body, that craving must be satisfied.

Although, amongst the cultivated, contests of brute force are obsolete, yet the same instinct still exhibits itself in divers other ways—in arrogance, in the love of wrangling, in the bullying of witnesses in a court of law, in the employment of invective, sarcasm, and vituperation. What is all this to the philosopher but the ingrained love for fighting, the desire to triumph over a foe, to get an enemy at a disadvantage.

We can lay it down as a principle, then, that the craving for excitement is a call of nature, an imperative physiological demand, the expression of a deeply-rooted instinct, which has its springs far back in antiquity. Too uniform a type of life is a deadly thing.

It is largely this desire for a more varied life that explains the migration of people from the simple life of the country to the bustle and stir of town.

> "'Tis life, of which our nerves are scant,
> Oh! life, not death, for which we pant;
> More life, and fuller, that I want."

The love of sport and other forms of amusement being so insurgent in man's nature, all legitimate opportunities should be afforded to the citizen to indulge himself in this respect. As for our national sport, horse-racing, probably more good comes of it than evil. Let any one witness the joyous emotion of the thousands who flock to a race like the Derby, and he will realise that—man cannot live by bread alone.

But *work*, too, is natural to man. Apart from ethical and economic considerations, work—always assuming it is congenial and performed under proper sanitary conditions—brings out the best that is in him, and conduces both to his mental and physical well-being. As Carlyle says: "For work is the grand cure of all the maladies and miseries that ever beset mankind—honest work, which you intend getting done."

If the muscles of the body are not used, they atrophy; if the brain is not actively employed its faculties share the same fate. No man's opinion is of much value unless he is in the habit of keeping his mind actively alert.

People who retire from business often end their days in misery. As the poet, Robert Buchanan, expressed it:

> "Far better to be tempest-tost,
> Than left to rot in the harbour mud.

We sometimes hear of the mischief done to health by mental overwork. It is not really the actual mental labour that does harm but the *mismanagement* of it. Worry, anxiety, and excitement may often hurt, but intellectual exertion by itself has injured nobody.

SLEEP

Sleep is a function of all living things. Shakespeare, with the insight of genius, exactly sums up the most modern knowledge of the subject, when he calls sleep "chief nourisher at life's feast." Sleep, indeed, is a positive thing, a recreative process, a winding up of the vital clock, a recharging of life's battery. Anabolism is active, katabolism relatively passive. It is a common mistake to assume that sleep is solely a necessity of the brain and nervous system. All other parts of the body, but especially the muscles, require sleep to reconstruct the energy expended during the day.

As regards the quantity of sleep needed, no hard-and-fast rule can be made, for everything depends on the *quality* of the sleep. The measure of an adequate amount of sleep is how one feels on getting up. Do you feel well, elastic, buoyant, cheerful, and fitted for the day's work? Six hours suffice with some; others, and especially neurotic subjects, require any time up to twelve hours. As a general principle it may be stated that nine hours is necessary for the average man and ten hours for the average woman. But, it cannot be too urgently insisted that a natural sleep cannot continue too long, and it is good advice to sleep until you feel completely refreshed. Sir Tatton Sykes, who recently (1913) died at the age of eighty-seven, said: "To bed at 8 P.M. and up at 6 A.M. is the secret of living long." For those who have to work hard it is wise to take breakfast in bed on Sundays.

An additional advantage of a good long sleep is that *with the body in the horizontal position the heart has least work to do*, and inasmuch as the duration of life is mainly determined by the "staying power" of the heart, this explains why bedridden people often live so long. As women expend their bodily energy more quickly than men, a nap of from half an hour to an hour in the afternoon is beneficial.

The human body has a remarkable periodicity in all its functions, so that to retire at a fixed time is of supreme importance for securing a good night's sleep. The bedroom should be moderately spacious, the walls of a subdued tint, pleasing to the eye. No vulgar pattern, glaring colours, or silly pictures should be permitted, for all such objects consciously or unconsciously influence the brain and prevent that repose of mind which is the harbinger of sleep. With some the ordinary white ceiling is a source of annoyance: why not, then, have it of a subdued tone?

Good ventilation is an indispensable condition, so one window at least should be opened from the top, and as much as possible.

Curtains, of course, are a mistake, for the reason that they are microbe-catchers. Many people think they take cold from having their windows open. If there be any foundation for this belief the explanation is that the incoming current of air wafts the microbes from the curtains into the mouth and nose. The popular opinion that night air is injurious is a fiction. (See "Ventilation.")

The temperature of the bedroom should not be below 55° F., for the reason that a lower temperature means so much bed-clothing that free perspiration from the skin—which is always taking place, though invisibly—is interfered with. Moreover, heavy bed-clothes throw more work on the muscles of respiration. Suppose, for example, there is an extra weight of one lb. on the chest. How much more work does this entail on the muscles of respiration? We breathe about seventeen times a minute. The sum then is: $17 \times 60 \times 9$ (for hours of sleep) *i.e.* 9180 lbs. have been unnecessarily lifted by the muscles of the chest. And these same muscles require their share of sleep just as much as any others.

The best position in bed for the whole body is the horizontal; this means that while the sleeper lies on his side the pillow should be just so high as to fill in the gap between head and shoulder. No close-fitting garments should be worn, for these interfere with perspiration.

The bed should be at a certain distance from the wall, so as to permit of a free circulation of air around it, of moderate size, and without curtains, for not only do those collect microbes and dust, but they interfere with the circulation of air around the head and under the sheets. The mattress should be of *strong* spring, allowing of no "dip."

Many plans have been recommended to those unable to secure the full blessing of sleep. The philosopher, Kant, advised people to direct their thoughts on indifferent subjects. Excitement, excessive intellectual effort, and any powerful emotion are inimical to it. The reading of some unexciting book before turning in is successful with some people.

A two-mile walk, and preferably in the country, is beneficial to many. Aubry in his biography of the great Harvey (1578–1657), the discoverer of the circulation of the blood, says: "He was hot-headed, and his thoughts working would many times keep him from sleeping; he told me, that then his way was to rise out of his bed, and to walk about his chamber in his shirt, till he was pretty coole, *i.e.* till he began to have a horror (shiver), and then return to his bed and sleep very comfortably."

With regard to actual insomnia it is necessary to be assured that the sleeplessness is a reality. Many people only fancy they have not slept. A good test in such cases is—Did you hear the clock strike? and how often?

General Advice to those Suffering from Insomnia.—Go to bed each night at the same hour. Take a warm bath, or if preferred, a foot-bath. Do not think out problems after dinner. Resolutely exclude from the mind all business and all the cares of life. Give up alcohol or reduce it to a nominal amount (tea and coffee must only be allowed at breakfast). Do not smoke much—one cigar, or two cigarettes, or one pipe after dinner. *Don't worry.* Remember the case of the man who on his deathbed said: "I've had a lot of trouble in my lifetime, most of which never happened." A long drive in an open motor car that does not shake often acts like a charm. Gardening is to be highly recommended where practicable; also golf. Eschew exciting games like bridge. Billiards after dinner is often a good sleep-inducer.

For those who work hard during the day it is often a good plan on arriving home to take a warm bath and lie down for an hour, then have dinner, smoke a pipe, read light literature (why not defer the daily paper till then?) up to nine or ten, then to bed.

Failing success to all these measures a complete change of scene will often effect the desired purpose. For example, a lady journalist compelled to reside in London has bouts of insomnia, but she finds she can procure blissful sleep by repairing periodically to Hindhead.

This above all—never take drugs: that way madness lies. Drug-induced sleep is not proper sleep—it is stupor! And the awakening, when all the carking anxieties set out once more on their maddening gallops!

THE INFLUENCE OF THE EMOTIONS ON HEALTH

Philosophers tell us that the human mind possesses three fundamental properties: the *Emotions*, the *Intellect*, and the *Will*. The feelings of pleasure, pain, grief, joy, fear, anger, and astonishment are examples of the various emotions. Contrary to what is usually thought, carefully tested experiments go to show that *men are more emotional than women*. Women's emotions are "like the ripples on the surface of the water," while men's are deeper, "like the ground swell." It is a matter of every-day experience that body and mind are reciprocally related, the one reacting on the other in many different ways. An emotion may either depress or stimulate. Witness to what degree bad news will wholly alter a man's expression; in what manner it can arrest the feeling of hunger; and how good news has quite the opposite effect. The happy and confident are less likely than those of opposite temperament to fall victims to disease, and more likely to recover when attacked. Faith brings happiness and "removes mountains." As an example of the power of cheering mental influence to alter the course of an illness, take the following: A woman has pneumonia. Her mind wanders, she is but partially conscious, and life hangs by a mere thread. She has a son, a *mauvais sujet*, away from home and long unheard of. A friend whispers into her ear a loving message from him. The mention of his name reawakens the dormant consciousness, her faculties revive. She grasps the nature of the message. Happy memories of her early motherhood float across the horizon of her thoughts. An intense desire to live seizes her. She recovers. As a good instance of a depressing emotion we may take fear. Say that it is fear of an infection that is felt. Here there is a lessening of the resistance to disease and a lowering of the powers of recovery when attacked by it. Hence it is that a person may actually frighten himself into an illness.

Shakespeare gives us a striking picture of the influence of a depressing emotion (in this case, disappointed love)

> "DUKE. And what's her history?
> VIOLA. A blank, my lord: she never told her love,
> But let concealment, like a worm i' the bud,
> Feed on her damask cheek: she pined in thought;
> And, with a green and yellow melancholy,
> She sat, like patience on a monument,
> Smiling at grief."

Human nature requires the support of a reasonable optimism.

Social Intercourse.—Few forms of emotional stimulus are more calculated to promote health than cheerful society. Think how it promotes appetite and aids digestion. Compare the case of a man dining alone, and having to study what he eats for fear of indigestion, with the same man dining in company and able to indulge himself with impunity. Again, a person mopes indoors, complaining of headache and feeling "out of sorts." A cheering visitor calls. An animated conversation ensues. The invalid at once brightens up, and when asked how the headache is, replies: "I've forgotten all about it." It is evident that agreeable company exercises a profound influence on metabolism.

Of all forms of cheering influences that which promotes *laughter* is the most powerful. It has been well said that the man who makes us laugh is a public benefactor.

The relationship between the various emotions and bodily states has been analysed by Professor William James. According to this great authority, the emotion is not felt by consciousness until it first produces those bodily changes which we call "the expression of the emotions." He says: "My theory is that the bodily changes follow directly the perception of the exciting effect, and that our feeling of the same changes as they occur, *is* the emotion. Common sense says: we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect; that the one mental state is not immediately induced by the other, that the bodily manifestation must first be interposed between, and that the more rational sentiment is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble because we are sorry, angry, or fearful, as the case may be. Everyone of the bodily changes, whatsoever it be, is felt acutely or obscurely the moment it occurs. If our theory be true, a necessarily corollary of it ought to be this—that any voluntary and cold-blooded arousal of the so-called manifestation of especial emotion should give us the emotion itself. Everybody knows how panic is increased by fright, and how the giving way to the symptoms of grief or anger increase those passions themselves. In rage, it is notorious how we work ourselves up to a climax by repeated outbreaks of expression. Refuse to express the passion and it dies. *Count ten before venting your anger, and its occasion may seem ridiculous.* Whistling to keep up courage is no mere figure of speech. On the other hand, sit all day in a moping posture, sigh and reply to everything in a dismal voice, and your melancholy lingers. There is no more valuable precept in moral education than this—if we wish to cure undesirable emotional tendency in ourselves we must assiduously, and in the first instance cold-bloodedly, go through the *outward movements* of those contrary dispositions which we prefer to cultivate. The reward of persistency will infallibly come in the fading out of anger or depression and the advent of real cheerfulness and kindliness in their stead. Smooth the brow, brighten the eye, contract the dorsal rather than the ventral aspect of the frame, and speak in a major key, pass the genial compliment, and your heart must be indeed frigid, if it does not gradually thaw."

HIGH BLOOD-PRESSURE AND THICKENED ARTERIES

These two conditions generally go hand in hand, and as factors influencing health and the duration of life, their importance cannot be over-rated.

Arteries are the elastic tubes which convey the blood from the heart. With advancing years they tend to lose their elasticity, becoming hard and thickened. Old age is a relative term and, medically considered, is to a large extent determined by the condition of the arteries, *i.e.* whether they are soft and elastic or hard and rigid. Hence the aphorism —*A man is as old as his arteries.*

There is no precise period of life at which this change comes on—it depends upon the family history and the way a man has lived. Sometimes the change sets in early. A man of thirty, for instance, may have arteries which are natural to a man at sixty, and vice versa. Thomas Parr, who lived to the reputed age of 152, is reported to have had very soft arteries to the end of his days.

High blood-pressure and thickened arteries may affect health and the duration of life in two different ways:

(*a*) An extra strain is thrown upon the heart. This is met by what is called hypertrophy, *i.e.* the organ enlarges. Later on, dilation ensues—a condition usually terminating in *cardiac failure.*

(*b*) An artery in the brain may rupture, and so cause *apoplexy.*

Unfortunately, high blood-pressure may exist for years without disclosing its presence. A man of middle life, for example, feeling in excellent health and spirits, goes to have himself examined for insurance. To his amazement, he is told that his arteries are hard, that his blood-pressure is high, and that he must pay an enhanced premium. He is forty, we will say, and he can only be accepted on the basis of fifty. In other words, he is, in the medical sense, ten years older than he ought to be!

Although it is not always an easy matter positively to determine the causes, it may be affirmed as a general principle that high blood-pressure and thickened arteries result from the circulation in the blood of poisons. Probably most of these poisons come by way of the alimentary tract—through, that is to say, over-feeding, improper feeding, alcoholic intemperance, constipation, &c. Insufficient mastication is a potent cause, for the reasons given in the chapter on "Food."

The whole object of treatment is to keep the blood-pressure low, and so to ward off the possible "cardiac failure" and the "apoplexy."

If a man is too fat, he must reduce his weight so as to get back to his normal weight of former years. Alcohol must be given up, or reduced to strictly moderate quantities. Tea and coffee are to be limited to breakfast time. All food must be carefully masticated.

Games *not requiring sudden effort*, such as golf and cycling on the level (and not against the wind), are to be recommended.

Massage, by removing stagnant humours, is often of marked benefit.

Most important of all is to have an occasional free evacuation of the bowels. A blue pill or calomel overnight, followed by a brisk saline purge in the morning. are time-honoured remedies.

LOSS OF HAIR. THE CARE OF THE SCALP

The baldness of old age does not here concern us. It results from the general lowering of nutrition incidental to advancing years.

People sometimes lose their hair after a fever, and in certain families premature baldness occurs in the males of succeeding generations.

Excluding such cases, it is now established that about 90 per cent. of premature baldness results from the infection of a particular microbe—the "bottle" bacillus. This buries itself in the skin of the scalp, giving rise to bran-like scales, popularly known as "scurf" or "dandruff." In course of time degeneration of the hair-follicles takes place, with the resulting loss of hair. It is well known that baldness is much rarer in women, a fact noticed by Aristotle, who wrote: "Neither children nor women nor eunuchs become bald."

Once complete atrophy of the hair-follicle has occurred, the growth of hair cannot be restored. If, however, proper steps be taken before the disease is advanced, much can be done to check the condition, and in many cases a regrowth of the hair may be expected.

The Comb.—The "teeth" should not be too pointed, otherwise the skin is likely to be torn. It should be sterilised by boiling once a week.

The Brush.—This should be kept scrupulously clean by washing in strong sodawater once a week, and afterwards disinfected by being dipped in a weak solution of lysol or formalin. No one should use another person's brush, for the microbe causing loss of hair can be conveyed from one scalp to another, just as the microbe of a fever can be conveyed from one person to another.

The hair should be brushed thoroughly night and morning. Once a week (once a fortnight for women) the head is to be carefully washed with soap and water, and well rinsed with water afterwards. If "dandruff" be present it indicates microbial infection. The washing should then be performed daily. For this purpose use a spirit-soap. A good one is composed of the following ingredients: thymolis 30 grains, saponis mollis 3 oz., spt. vini methyl. 3 oz. First moisten the head with warm water, then pour about a teaspoonful of the soap-spirit into the palm of the hand, and now induce a good lather. The soap must be well rubbed into the skin of the scalp, for the object is to get to the soil from which the hair grows. Allow the soap to remain on the part for about ten minutes. Afterwards, wash it all off by several changes of water. Finally, dry thoroughly. Some people, especially women, may complain that their hair afterwards becomes "sticky." This generally means insufficient rinsing, but should efficient rinsing not remove the "stickiness," then beat up the yolk of an egg in a glass of water, and apply the mixture to the hair.

As washing the head removes some of the natural grease of the part, it is a good plan to rub on the scalp a small quantity of olive or almond oil, afterwards brushing the hair, so that each hair has a thin coating of oil adherent to it.

As light and air possess strong germ-killing influence, it is a good plan, when walking in the country, or when playing golf or tennis, to remove the hat.

Hard hats should never be worn. They reduce the blood-supply by constricting the arteries, and also exclude light and air.

It is very important to understand that the hair should never be allowed to remain wet. The water forms an emulsion with the secretions of the scalp, and this blocks the hair follicles and tends to their degeneration.

NEURASTHENIA, THE PERSON WITH "NERVES," HYPOCHONDRIA

"The heart of another is a dark forest."—
Russian Proverb.

Broadly speaking, the span of human existence may be divided into three stages: the stage of childhood, *i.e.* from birth up to fifteen; the stage of adolescence, *i.e.* from about fifteen to about twenty-five; the stage of full manhood.

During childhood there is a general mental likeness between the two sexes; afterwards, they diverge from one another, each to develop its own distinctive sex attributes. The dominant characteristic of childhood is egoism.

The period of adolescence, which lasts about ten years, is the period of "man in the making." During this time the higher mental qualities are formed, while character and conduct assume their final shape. *It is the critical period of life, and the good or evil habits now acquired remain until the end.*

With the arrival of full manhood should come altruism—that quality upon which organised society is built. Did we all remain egoistic boys and girls, society, as we understand it, would be impossible.

Martial gave us long ago the note of the sane and healthy man:

> "To look on death with placid eye,
> And neither fear nor wish to die."

With the neurasthenic and hypochondriac it is quite otherwise. To both a morbid fear of death is ever present, although usually not admitted, perhaps not even realised. This obsession colours the entire outlook on life.

To treat of the neurasthenic first. He may be defined as a person afflicted with egomania, that is, an abnormal love of "self"; his mental development is arrested, for he remains, in many respects, the egoistic child. He is self-absorbed—himself the pivot on which the whole world rotates. He is specious, plausible, great at dissimulation and excuses but could we probe beneath the surface and lay bare his inmost soul, we should find the central fact of his existence to be "self." With all healthy inclinations starved and withered, with his mind an unweeded garden in which envy, hatred, malice, and spite have been allowed to flourish, outside interests he has none—there's no room for them.

He has no kindliness of heart, no love of country, no pride of race, no generous enthusiasms, no real affection for relatives or friends—friends! has he any? But he has a very great affection for himself. Vegetating in selfishness, he is usually a coward, moral and physical. Although history for him has no meaning, and literature no existence, and ignorant of his own ignorance, and most ignorant of what he's most assured, yet he has very decided opinions, and is good at making a platitude plausible by making it pompous. But he never really thinks; he only thinks he thinks.

Nature, meanwhile, has been strict in her account-keeping. The day of reckoning is at hand. The bill is presented. It is politely called a "nervous breakdown." Of course he whines that fate has been unkind, or that he must have inherited his "nerves" from one of his parents, or from some member of his race—for he is well versed in the latest pseudo-scientific jargon. He can never be got to understand that his condition is the logical outcome of his wretched scheme of existence, that having graduated in the school of selfishness, he has simply educated and qualified himself for the misery which now knocks at his door. Nature does not return good for evil; she gives blow for blow.

The only hope for this kind of being is to purge his soul; that way alone salvation lies. Let him take up his New Testament and read in St. Luke: "I will arise and go to my Father and I will say unto Him, Father, I have sinned against Heaven and in Thy sight: I am no more worthy to be called Thy son: make me as one of Thy hired servants." A perusal of Carlyle's *Gospel of Work* might possibly act as a tonic to his nervous system: "Long enough has that poor 'self' of thine tormented thee. . . . Know what thou canst work at; and work at it, like a Hercules! . . . The whole soul of a man is composed into a kind of real harmony, the instant he sets himself to work."

The **hypochondriac** is twin sister to the neurasthenic: here, too, egomania is the keynote to the character. Without any basis of actuality, the hypochondriac believes he is the subject of some serious bodily disease, and upon this he concentrates all his attention.

With him:

> "The Body is a torture to the Soul;
> A Hell, a fate, a load, a stern control,
> That weighs it to the ground with many woes,
> Nor e'er allows it to enjoy repose."

A well-known example is the case of the man who after reading a long description of symptoms, exclaimed: "By heavens, I've got that disease." Imagine his surprise when, on turning over the page, he found the symptoms were those of pregnancy! Advice is generally futile to the hypochondriac. It is like trying to whistle down the wind, for no sooner do you succeed in getting one false idea out of his head than another replaces it. There is an Italian proverb that runs: "He who scrubs the head of an ass wastes his own soap."

The moral to be deduced is that the conditions described being the result of a process of wrong thinking, wrong living, and wrong feeling, the essential thing is to start right in youth—to get on the right track, as it were, for it soon becomes too late to retrace one's steps. As Huxley says: "It is a plain and elementary truth that the life, the fortune, and the happiness of everyone of us do depend upon our knowing something of the rules of a game infinitely more difficult and complicated than chess. It is a game that has been played for ages, every man and woman of us being one of the two players in a game of his or her own. The chess-board is the world, the pieces are the phenomena of the Universe, the rules of the game are what we call the laws of nature. The player on the other side is hidden from us. We know his play is always fair, just, and patient. But also we know to our cost, that he never overlooks a mistake or makes the smallest allowance for ignorance. To the man who plays well, the highest stakes are paid with that sort of overflowing generosity with which the strong shows delight in strength. And the one who plays ill is checkmated—without haste, but without remorse."

MASSAGE

This word is supposed to come from the Arabic *mass*, which signifies "pressing the muscular parts of the body with the hands, and exercising traction on the joints in order to give suppleness and to stimulate vitality." The method has been employed by different races from time immemorial. In the *Odyssey*, the women are described as rubbing and kneading the heroes on their return from battle.

An interesting account given by Captain Cook (1728–1779) of the treatment of sciatica by the Pacific Islanders, illustrates so clearly the whole theory of the modern practice of massage, that it is worth quoting: "The manner in which our commander was freed from a rheumatic complaint, that consisted of a pain extending from the hip to the foot, deserves to be recorded. Otoo's mother, his three sisters, and eight other women, went on board for the express purpose of undertaking the cure of his disorder. He accepted of their friendly offer, had a bed spread on the cabin floor, and submitted himself to their directions. Being desired to lay himself down among them, then, as many of them as could get round him, began to squeeze him with both hands, from head to foot, but more particularly in the part where the pain was lodged, till they made his bones crack. After undergoing this discipline about a quarter of an hour, he was glad to be released from the women. The operation, however, gave him immediate relief, so that he was encouraged to submit to another rubbing down before he went to bed; the consequence of which was that he was tolerably easy all the succeeding night. His female physicians repeated their prescription the next morning and again in the evening; after which his pains were entirely removed and the cure was perfected."

The effect of massage is to accelerate the blood-flow through a part, to remove stagnant humours, and to cause an improvement in local and general nutrition, as well as in the quality of the blood.

The qualifications necessary for a good masseur are: physical strength, a fine sense of touch, the capacity for taking infinite pains, and a kind and sympathetic nature.

The practice of massage consists in: (*a*) stroking, (*b*) friction, (*c*) pinching and kneading.

Beginning with the feet, the operator pinches up, firmly but gently, the skin and rolls it between his thumb and forefinger, after which the small muscles of the foot are kneaded from below upwards. The foot is then held firmly and moved freely in all directions. Next, the ankle is treated in the same manner, being stroked from the toes to the leg. Circular friction is then applied to the leg, after which the muscles of the calf are bunched up and well kneaded, and at intervals the part is stroked by the thumb in a direction upwards from ankle to knee. The hands and arms are now dealt with in like manner. Attention is next devoted to the thighs, buttock, back and neck, friction, kneading, and stroking being applied in turn. Afterwards the skin and underlying fat of the abdomen are pinched up and well rolled, and subsequently the entire thickness of the abdominal wall is grasped by the hand and rolled. The chest must now be manipulated in an upward direction along the breast-bone, and the big muscles kneaded and pinched.

Lastly, the skin and muscles of the neck are dealt with in a direction from above downwards.

It will be observed that the manipulations are applied centripetally, that is to say, towards the heart, as this is the direction in which the blood returns to that organ.

BREATHING EXERCISES

Breathing takes place by means of movements of the ribs and diaphragm—a flat muscle which separates the chest from the abdomen. During inspiration, the ribs are elevated and the diaphragm descends; during expiration, the ribs descend and the diaphragm ascends.

Respiratory exercises stimulate the flow of blood through the lungs, and thus facilitate the excretion of waste products, and they do more than this: they tend to keep the chest-wall mobile, a very important consideration in view of the fact that as one gets older the chest tends to become rigid. This is one of the troubles in connection with the "winter cough" of the elderly, for an immobile chest means that the expectoration cannot be got rid of. Not only this, but with a mobile chest "winter cough" is much less liable to occur.

Breathing exercises are of great use in all *chronic affections of the lungs*. The more perfectly developed the lungs and the more mobile the chest-walls, the less the tendency to bronchitis, pneumonia, and phthisis. Nothing is more certain than that small, ill-developed lungs are prone to tuberculosis. Not only do good lung development and chest mobility tend to prevent lung disease, but they place the individual at an advantage should he happen to develop it. In *asthma* the effect of breathing exercises is often striking.

In *heart disease* the exercises are often of marked benefit, for by aiding the circulation of the blood, they relieve the work of the heart, and thus conserve its energy.

Great benefit can be derived from respiratory exercises in *functional diseases of the nervous system*. By accelerating the flow of blood through the brain, they not only increase the supply of oxygen, but they also promote the withdrawal of waste products. *Disorders of digestion* can often be greatly benefited by breathing exercises. It must be remembered that general muscular exercises, such as walking, running, cycling, cause a widespread effect on the circulation, the blood-flow to the abdominal organs being lessened. Hence it is that active muscular exercise after a meal tends to retard digestion. Suitable breathing exercises cause an increased flow of blood to the abdominal organs, improving the secretion of the digestive juices, as well as stimulating both the liver, stomach, and intestines. In the treatment of constipation they are often of marked benefit.

It is well known that *obesity* is predisposed to by defective oxygenation of the tissues. Respiratory exercises, by increasing the oxygen in the blood, tends to induce fat-absorption.

It is now held that many cases of *stammering* are due to faulty breathing, the diaphragm being the muscle chiefly at fault. Such cases often yield to breathing exercises systematically carried out.

An old-fashioned remedy for *hiccough* is to hold the breath for a time. The best plan is to take a series of rapid breaths, "holding the breath" at intervals for as long as possible.

Deep breaths are very helpful in promoting *sleep*.

The Various Kinds of Breathing Exercises.—All impediments to the free movements of the chest must be removed. The air which enters the lungs should be as pure as possible, more especially since in deep breaths any impurities that may be inhaled will be drawn deeply into the lungs. In the first place, normal breathing takes place through the nose, the ingoing air being thereby warmed, moistened, and filtered. Seeing what an important part the nose plays in preparing the inspired air, it is imperative that there shall be no nasal obstruction, and therefore every patient should be carefully examined for this very common condition.

Two types of respiration are recognised: the *costal*, produced by movements of the ribs, and the *abdominal*, produced by the action of the diaphragm. The patient must first learn to dissociate costal and abdominal breathing, since each has its own peculiar effects.

Abdominal breathing is best learned lying on the back. The individual must concentrate his attention on the abdomen, seeking to protrude it to the utmost with every inspiration, and to keep the chest fixed. He must now retract the belly to its fullest possible extent.

Costal breathing must be practised both in the horizontal and upright postures, the attention being concentrated on the ribs, and these should be raised to the utmost, while every effort is being made to keep the anterior abdominal wall stationary.

Having mastered these principles the patient is in a position to undertake the following various kinds of breathing exercises as prescribed by Dr. Harry Campbell:

Active Breathing Exercises.—(1) Take the fullest possible costal inspiration, followed by an ordinary expiration.

(2) Expire to the utmost, bending the body

somewhat forward, and then take an ordinary inspiration, resuming the vertical position.

(3) Take the fullest possible costal inspiration, and then expire to the utmost, bending the body forwards.

(4) Stand with the legs well apart, and take a deep abdominal inspiration, followed by a passive expiration, *i.e.* one resulting from recoil merely.

(5) Stand with the legs well apart, and take a deep abdominal inspiration, followed by a deep abdominal expiration.

(6) Sit down. Fold the hands on the lap; bend the body as far forward as possible. Now take the deepest possible abdominal inspiration with closed mouth, and then gradually raise the body, lift the arms over the head, and take the fullest possible costal inspiration. After this passively expire—*i.e.* by recoil merely—with open mouth, allowing the arms to drop suddenly. Expiration should not proceed beyond the limit of ordinary expiration, and should not occupy more than one second, inspiration occupying not more than six.

Breathing Exercises Combined with other Exercises.—In this way groups of muscles may be strengthened at the same time that the patient derives the special advantages derived from increased respiratory activity.

The patient stands. Inspiration should be taken through the nose, expiration through the open mouth. The former long, the latter short.

(1) The arms, held stiff, are swung round as far as possible in the open manner. Inspiration accompanies the upward movement, expiration the downward.

(2) The arms held stiff are moved from the side of the body outwards to the vertical, and then returned to the original position.

(3) The arms are bent at the elbows and held close to the sides. They are moved upwards, and extended to the vertical with inspiration, being returned to the original position with expiration.

(4) The arms hanging down, the hands are moved upwards into the armpits as far as they will go, the elbows moving outwards. They are then returned to the original position.

(5) The arms held horizontally in front of the body are swung backwards in the horizontal plane as far as they will go, and then returned to the original position.

(6) While the hands rest on the hips, with the thumbs behind and the fingers in front, the elbows are moved backwards as far as they will go, and are then returned to their original position.

(7) The arms held horizontally forwards are swept downwards and backwards as far as they will go, the body meanwhile bending forwards, the original position being then resumed.

Exercises for Developing the Abdominal Muscles.—(1) Firmly retract the belly, and gradually increase the duration of the retraction from a few seconds to one minute.

(2) Repeatedly retract the belly at the rate of from ten to sixty retractions per minute, keeping the ribs fixed. A deep abdominal breath should alternate with each retraction.

(3) Firmly retract the belly, and then, when the retraction is kept up, inspire and expire to the fullest extent. Time from ten to sixty seconds.

All these exercises should be performed in the standing, sitting, and lying postures in turn.

(4) The patient stands with his legs two or three feet apart, and, the knees being kept fixed, the trunk is moved forwards as far as possible, and then brought back to the vertical.

(5) The patient stands with his legs apart, and bends the trunk as far as possible, first on one side and then on the other.

(6) The patient stands, and the body is bent backwards, the knees being at the same time gradually bent and the arms slowly extended over the

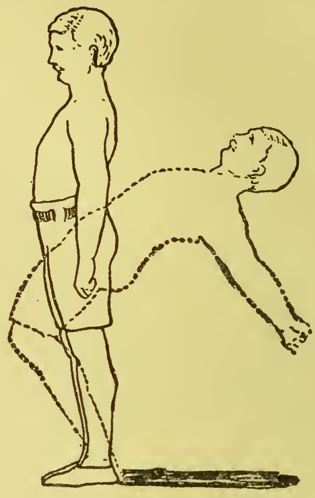

FIG. 1.

head, and then separated. After the body has been bent backwards as far as possible without upsetting the equilibrium, it is gradually brought back to the vertical position.

General Exercises.—The advantages of the following exercises are that certain groups of muscles not ordinarily used—or but little used—in the daily routine of our lives are brought into action.

Before starting on the prescribed exercises the patient must practise breathing properly, *i.e.* he inflates his chest to its fullest limit, inhaling the air through the nose, then expiring through the mouth. This should be repeated several times.

The exercises are to be discontinued as soon as any feeling of fatigue comes on. It is advisable to do the exercises in front of a glass to see that they are being carried out correctly.

If the patient is in an enfeebled state of health, the exercises are done with the help of an instructor, who himself manipulates the patient's movements.

Lying-down Exercises.—(*a*) Lie flat on back on

FIG. 2.

the floor, legs together, shoulders on same level with one another, and head in a line with body;

arms straight by the side, with palms up. Approximate shoulder-blades so as to expand the chest. Now stretch arms out to form a cross with the body, then move them up so as to touch the ears—keeping them straight all the time. Repeat these movements several times.

(*b*) Raise one leg (kept straight) to the vertical, and then return to position of rest. Now do the same with the other leg. Repeat several times.

(*c*) With shoulders fixed, deflect the head to each side, the cheek to touch the ground.

(*d*) Same position on back. Elbows close to

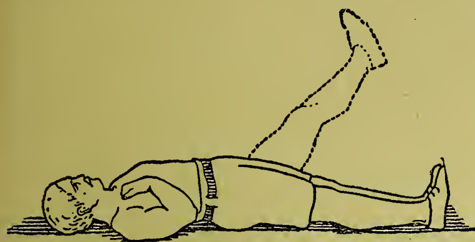

FIG. 3.

side, forearm fully bent on arm, with fists closed. With knee straightened, move each leg alternately outwards as far as it will go. Then return to position of rest.

(*e*) Bend head forwards so that chin touches front of chest.

(*f*) With arms to side of body and palms turned

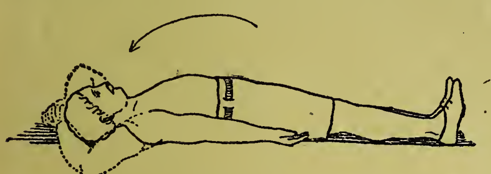

FIG. 4.

up, make a circular movement so that fingers can lock above head; then reverse the movement, bringing arms to side of body.

(*g*) Raise one leg to the vertical (knee straight),

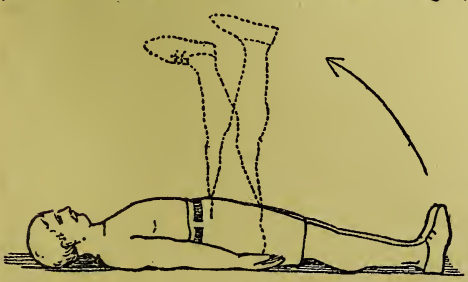

FIG. 5.

then sweep it outwards to the ground. Resume position of rest. Do the same with other leg.

(*h*) Bend head down so that chin touches chest. Then, with shoulders fixed, incline head to one side so that ear touches shoulder. Return to position of rest. Repeat on other side.

(*i*) Rise to sitting posture without the help of arms. Straighten out back, neck, and head, making them rigid. Then slowly resume the lying posture.

(*j*) Keeping the legs straight, raise them both together to the vertical, then bring them slowly down.

(*k*) With thumb held forward, place the right

FIG. 6,

FIG. 7.

hand on the chest as high up and as far back as possible; put the left forearm over top of head with fingers touching right ear. Then bend all that part of the body which is above the right hand as far as possible to the right. Now take some deep inspirations, and resume position of rest. Repeat the exercise in a reverse manner.

(*l*) Make a cross with arms and body Bend the

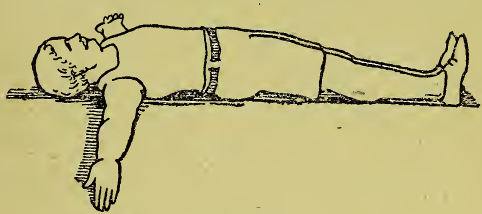

FIG. 8.

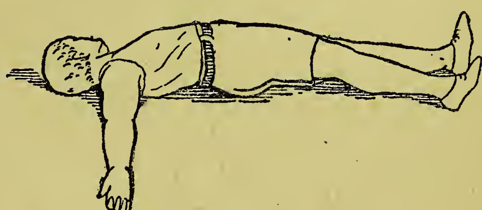

FIG. 9.

whole body to the left and remain in this position for a short time. Resume position of rest, and then repeat the exercise on the opposite side.

(*m*) Lie on stomach. Hold palms down and perform "swimming" movements with the arms and legs.

Standing Exercises.—(1) Clasp hands behind waist, inspire. Now stretch the clasped hands downwards and expire. (See Fig. 10.)

(2) With head erect, bring arms upwards to side of head. Now bend the body on the hips forwards (keeping knees quite straight) until the fingers touch the ground. Then return to former position. Repeat the movement several times. (See Fig. 11.)

(3) Squat slowly down on the heels with arms

held out straight in front. Regain the standing position, at the same time letting the arms fall.

(4) With hands resting on the hips bend the body

Fig. 10.

forwards, backwards, and to the side. Then execute a circular movement.

(5) Approximate the arms horizontally backwards as far as possible, during inspiration; then

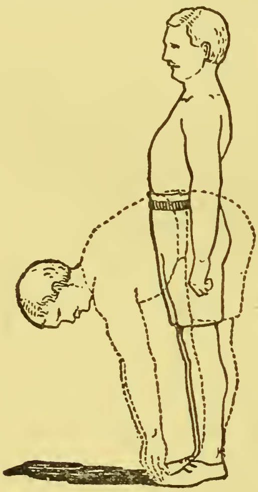

Fig. 11.

reverse the movement in front of the body during expiration.

For Redundant Chin.—Patient sitting, slowly bends head downwards until chin touches chest, then rapidly throws head backwards as far as it will go, and remains in this position for a short time. Repeat this exercise several times at different periods of the day.

EUGENICS. HUMAN MISFITS

This word means "well-born." Burton in his *Anatomy of Melancholy* so crystallises all the modern views on the subject of Eugenics that his dissertation—although written nearly three hundred years ago—is worth quoting:

Causes of Melancholy

"Parents a Cause by Propagation

"So many several wayes are we plagued and punished for our fathers' defaults; in so much that (as Fernelius truly saith) '*it is the greatest part of our felicity to be well born; and as it were happy for humane kind, if only such parents as are sound of body and mind should be suffered to marry.*' An husbandman will sow none but the best and choicest seed upon his land; he will not rear a bull or an horse, except he be right shapen in all his parts, or permit him to cover a mare, except he be well assured of his breed; we make choice of the neatest kine and keep the best dogs; 'Quanto id diligentius in procreandis liberis observandum?' and how careful then should we be in begetting of our children? In former time, some countreys have been so chary in this behalf, so stern, that if a child were crooked or deformed in body or mind, they made him away; so did the Indians of old (by the relation of Curtius), and many other well-governed commonwealths, according to the discipline of those times. Heretofore, in Scotland (saith Hect. Boëthius), 'If any were visited with the falling sickness, madness, gout, leprosie, or any such dangerous disease, which was likely to be propagated from the father to the son, he was instantly gelded; a woman kept from all company of men: and if by chance, having some such disease, she were found to be with child, she with her brood were buried alive': and this was done for the common good, lest the whole nation should be injured or corrupted. A severe doom, you will say, and not to be used amongst Christians. Yet more to be looked into than it is. For now, by our too much facility in this kind, in giving way for all to marry that will, too much liberty and indulgence in tolerating all sorts, there is a vast confusion of hereditary diseases, no family secure, no man almost free from some grievous infirmity or other. When no choice is had, . . . it comes to pass that our generation is corrupt; we have many weak persons, both in body and mind, many feral diseases raging amongst us, crazed families, '*parentes peremptores*'; our fathers bad; and we are like to be worse."

According to the report of a Royal Commission in 1908 there were in England and Wales—apart from the certified lunatics—149,628 mentally defective persons. From this stock springs the epileptics, the greater portion of the insane, the majority of the criminals, and most of the paupers and tramps. The fertility of the mentally defectives is considerably greater than that of normal individuals, and their unrestricted increase is a standing menace to the prosperity of the nation. Careful investigations have established the fact that a normal child can never be begotten from feeble-minded parents Conscience—that faculty within us which decides on the rightness or wrongness of our actions—is innate and partly developed by education and training. As Dr. Maudsley says: "One may safely affirm that an unremitting instillation of moral principles, from the appearance of the first tooth onwards to the loss of all his teeth by a natural decay, would not avail to make a moral being of the congenital imbecile; and that no moral training would ever have transmuted the moral nature of Judas Iscariot into that of Jesus of Nazareth." Sir Francis Galton, the great apostle of Eugenics, made the confident assertion that it would be quite practicable to produce a highly-gifted race of men by judicious marriage during several successive generations.

TURNING THE CORNER

As the strength of a chain is the strength of its weakest link, so the age of man is the age of his weakest organ—which may be his heart, lungs, stomach, kidneys, liver, or brain. Age, indeed, is a relative term, not measurable by length of years. While some are old at thirty, others are young at eighty. It all depends on the constitution a man inherits from his ancestors and the way he has lived. Lord Roberts, for example, is young at eighty-one. He can deliver a lengthy and closely-reasoned speech full of wisdom, and can walk as much as twenty miles at a stretch.

Attempts have been made to estimate the natural limits of human life. According to Flourens, an animal's age is five times that of the period taken to reach maturity. Assuming it to be the same with man, then human life ought to last one hundred years. Now centenarians are rare (in the census of 1901, forty-seven males and ninety-nine females had reached one hundred years), and as therefore, the vast majority of deaths happen before that age is reached they must all be regarded as due to disease or accident—that is, to something preventible, and not as occurring in the course of nature.

Probably most of us have no conscious knowledge of advancing age, and only become aware of it by reflecting on the landmarks in our history, such as the date of our marriage, the ages of our children, or when a particular horse won the Derby. Old people, as a rule, if free from bodily sufferings, are generally cheerful and happy—a frame of mind conducive to further length of years.

Many of the best literary efforts have been the work of age. Cicero wrote his celebrated treatise on *Old Age* at sixty-three. Tennyson retained his art of pure and faultless workmanship up to the very end of his life. That exquisite poem, "Crossing the Bar," was composed at the age of eighty-two. Cato learned Greek when past seventy. The era of threescore and ten, says Necker, is an agreeable age for writing, "Your mind has not lost its vigour, and envy leaves you in peace." Cicero has thrown a charm over old age, and shown that by the internal sources of happiness they possess, the closing years of life may not only be passed comfortably and agreeably, but usefully. Addison, Steele, and Johnson also have eulogised the intellectual advantages and pleasures of old age, proving that the desire for knowledge is not abated by bodily frailty. The Bible testifies to the frequency of old age in ancient times, and to the complete preservation of the faculties in the aged.

The Romans placed the *grand climacteric*—the time at which some great change in our bodies is supposed to take place—in men at sixty-three. Then the appetite for food becomes less, and the digestive organs lose in vigour. There is less aptitude for prolonged muscular and mental exertion. The passions by which the mind is swayed—ambition, hope, fear, love, joy, and hatred become less dominant. The driving power of the will weakens, and memory for recent events fails.

The *tedium vitæ* which some experience is beautifully expressed by Shakespeare when Antonio, the former young and lusty merchant of Venice, says:

> "In sooth, I know not why I am so sad.
> It wearies me; you say it wearies you;
> But how I caught it, found it, or came by it,
> What stuff 'tis made of, whereof it is born,
> I am to learn;
> And such a want-wit sadness makes of me,
> That I have much ado to know myself."

When we study the body changes which occur, now that "the way of life is fallen into the sere, the yellow leaf," we find that the most important are in respect of the circulatory and respiratory systems. The heart and blood-vessels lose their elasticity and harden, and this explains the liability to "heart-failure" and to "apoplexy"—a subject already discussed in the chapter on blood-pressure. The thorax tends to get rigid so that the breathing becomes shallow—a condition predisposing to winter bronchitis. (See "Respiratory Exercises.")

Many elderly people suffer from joint-affections—vaguely designated "rheumatic." Here the cause is either in the muscles around the joints, or in the joints themselves, the effect of some poison that has settled in the part. How the poison is generated it is impossible to say definitely. It probably originates in the intestinal tract.

Compensations.—The aged are virtually exempted from many of the diseases which attack youth and manhood. Thus, the eruptive fevers are hardly ever met with in the aged, rheumatic fever never occurs, typhoid is very rare, tuberculosis is almost unknown, and headache is rare.

Hints for the Conduct of Life in the Elderly.—Food.—The father of physic—Hippocrates—in an aphorism that has descended to us through 2000 years, says that "old people bear abstinence well." The wisdom of this remark is apparent when we bear in mind that, as Dr. Harry Campbell has clearly demonstrated, after the age of forty metabolism progressively diminishes, so that the needful amount of food is less.

Be on your guard against excesses at the table. In the words of Epictetus: "Choose rather to punish your appetites than be punished through them."

Many old people are alarmed by their becoming thinner, and to counteract this, they think they must eat more. This is quite wrong: *Corpora sicca durant* is an old and wise saying.

Inquiry into the habits of centenarians shows clearly, without doubt, that long life depends upon no particular form of diet. Some are meat-eaters, and others vegetarians. Some smoke and drink alcohol; others abstain.

The bowel functions must be kept regular. Find out a useful laxative and keep to it. Castor-oil taken at night time or in the early morning is probably the best cleanser.

Warmth.—Old people crave sunshine and warmth. Cold has such a prejudicial effect on them that it cannot be too carefully guarded against by warm and suitable clothing.

Exercise.—The most natural form of exercise is walking. All the organs of the body benefit by it. Atrophy of the muscles is one of the common manifestations of senility, and a chief cause of loss of weight in the aged. Walking keeps up the nutrition of the muscles, so that atrophy is less liable to occur. Regular walking exercises should not be interrupted for bad weather, because if the practice is given up for a time it frequently happens that it cannot be resumed without discomfort.

Whenever practicable the walking should be done in the country. Golfing is perhaps the best kind of exercise, for by it all the muscles of the body are put into action, deep breathing is favoured, the air inhaled is pure, the abdominal muscles strengthened, the liver and other organs stirred up, the circulation quickened, and the mind exhilarated.

All sudden and violent exercise must be avoided.

Pay particular attention to *respiratory exercises* (see chapter on). As already observed, the lungs tend to undergo atrophy in the old, and the chest to become rigid. The exercises will promote the nutrition of the lungs and thus counteract the tendency to atrophy, while also maintaining the elasticity of the chest-walls. Respiratory exercises, indeed, constitute a kind of massage for the organs in the chest and abdomen.

The Mind.—Endeavour to foster cheerfulness and a happy and contented spirit. Cheerfulness is to the body what sunshine is to the plant. Worry and low spirits depress the animal functions. *A merry heart doeth good like a medicine, but a broken spirit drieth the bones* (Proverbs xvii. 22).

The will is a great power, and should be carefully cultivated from youth upwards. Will to maintain your powers and faculties for as long as possible. The faculties often decay from want of use. Find occupation for your brains. Take a healthy interest in things and broaden your outlook in life. No one is so boring as the man who has one idea firmly fixed in his head and finds no room for a second. *Those who possess few ideas are apt to be possessed by them.* Cultivate some taste or hobby outside your actual work. Engrossed all your life in business, perhaps you have neglected the literary side of your nature. You may say you don't possess one. How do you know? Try your hand at some good author—say, Shakespeare. You will probably start with a prejudice, and object that you were "fed up" with him at school, and that you have no fancy for that kind of thing. But ponder this. The best brains the world over agree that his plays are the highest achievement of the human mind. He is admitted to be the greatest artist of all time in his mastery over words. Thackeray employs 5000 words, Milton 7000, and Shakespeare 21,000! He has woven into the web of our language more phrases than any other writer.

He seems almost to have known everything, and he shows a clearer insight into human nature than any other writer. He above all men is the most learned in the human heart. Listen to what Tennyson said of him: "The man one would wish to show as a sample of mankind to those in another planet." On his deathbed Tennyson exclaimed: "Where is my Shakespeare? I must have my Shakespeare." His last recorded words were, "I have opened it," referring to the book he had opened at the lines which he used to say brought tears into his eyes from their simplicity:

> Hang there like fruit, my soul,
> Till the tree die."

This volume of Shakespeare was buried with him, and now lies next his heart.

So see if you cannot enter into companionship with this great Shakespeare of ours. The best way is to take one play, say *The Merchant of Venice*, or *Hamlet*, or *Macbeth.* Start, if you like, with *Lamb's Tales*, so as to get an idea of the plot and characterisation of the play beforehand. Then read, in such a book as John Masefield's *Shakespeare*, a brief exposition of the play. Now read the actual play itself. You cannot do better than provide yourself with the copy brought out by Cassells. It costs but sixpence, and possesses the advantage of a preface written by that ripe scholar Henry Morley. You must read and re-read, until every word is thoroughly understood and every character fully known. Read faithfully and with your whole attention, and it will be surprising if you do not find that great literature has a potent charm for you as it ever had for intelligent men throughout the ages.

THE LAST HILL

> "We are such stuff as dreams are made of, and our little life
> Is rounded with a sleep."

"While many of the processes which lead to death are painful, death itself is painless, natural, like the fading of a flower or the falling of a leaf. Our dear ones drift out on the ebbing tide of life without fear, without pain, without regret, save of those they leave behind. When death comes close enough, so that we can see the eyes behind the mask, his face becomes as welcome as that of his twin-brother sleep" (Woods Hutchinson).

> "Twilight and evening bell
> And after that the dark!
> And may there be no sadness of farewell
> When I embark;
>
> For tho' from out our bourne of time and place
> The flood may bear me far,
> I hope to see my Pilot face to face
> When I have crossed the bar."

KENNETH CAMPBELL, M.B., F.R.C.S.

YOUTH AND SEX

PART I: GIRLS

INTRODUCTION

Probably the most important years in anyone's life are those eight or ten preceding the twenty-first birthday. During these years one of the two great developmental factors known as *Heredity* bears its crop, and the seeds sown before birth and during childhood come to maturity. During these years also the other great developmental force known as *Environment* has full play, the still plastic nature is moulded by circumstances, and the outcome of these two forces is seen in the manner of individual that results.

The time is generally alluded to under two heads: (1) Puberty, (2) Adolescence.

By Puberty we understand the period when the reproductive organs are developed, the boy or girl ceasing to be the neutral child and acquiring the distinctive characteristics of man or woman. The actual season of puberty varies in different individuals from the eleventh to the sixteenth year, and although the changes during this time are not sudden, they are comparatively rapid.

By Adolescence we understand the time when the individual is approximating to the adult type, puberty having been already accomplished. Adolescence corresponds to the latter half of the developmental period, and may be prolonged even up to twenty-five years.

CHANGES OBSERVABLE DURING PUBERTY AND ADOLESCENCE IN GIRLS

1. In the Bodily Framework.—During this period the girl's skeleton not only grows remarkably in size but is also the subject of well-marked alterations and development. Among the most evident changes are those which occur in the shape and inclination of the pelvis. During the years of childhood the girl's pelvis has a general resemblance to that of the male, but with the advent of puberty the vertical portion of the hip bones becomes expanded and altered in shape, it becomes more curved, and its inner surface looks less directly forward and more towards its fellow bone of the other side. The brim of the pelvis, which in the child is more or less heart-shaped, becomes a wide oval, and consequently the pelvic girdle gains considerably in width. The heads of the thigh bones not only actually, in consequence of growth, but also relatively, in consequence of change of shape, become more widely separated from each other than they are in childhood, and hence the gait and the manner of running alters greatly in the adult woman. At the same time the angle made by the junction of the spinal column with the back of the pelvis, known as the sacro-vertebral angle, becomes better marked, and this also contributes to the development of the characteristic female type. No doubt the female type of pelvis can be recognised in childhood, and even before birth, but the differences of male and female pelves before puberty are so slight that it requires the eye of an expert to distinguish them. The very remarkable differences that are found between the adult male and the adult female pelvis begin to appear with puberty and develop rapidly, so that no one could mistake the pelvis of a properly developed girl of sixteen or eighteen years of age for that of a boy. These differences are due in part to the action of the muscles and ligaments on the growing bones, in part to the weight of the body from above and the reaction of the ground from beneath, but they are also largely due to the growth and development of the internal organs peculiar to the woman. All these organs exist in the normal infant at birth, but they are relatively insignificant, and it is not until the great developmental changes peculiar to puberty occur that they begin to exercise their influence on the shape of the bones. This is proved by the fact that in those rare cases in which the internal organs of generation are absent or fail to develop there is a corresponding failure in the pelvis to alter into the normal adult shape. The muscles of the growing girl partake in the rapid growth and development of her bony framework. Sometimes the muscles outgrow the bones, causing a peculiar lankiness and slackness of figure, and in other girls the growth of the bones appears to be too rapid for the muscles, to which fact a certain class of "growing pain" has been attributed.

Another part of the body that develops rapidly during these momentous years is the bust. The breasts become large, and not only add to the beauty of the girl's person, but also manifestly prepare by increase of their glandular elements for the maternal function of suckling infants.

Of less importance so far as structure is concerned, but of great importance to female loveliness and attractiveness, are the changes that occur in the clearing and brightening of the complexion, the luxuriant growth, glossiness, and improved colour of the hair, and the beauty of the eyes, which during the years which succeed puberty acquire a new and singularly attractive expression.

The young girl's hands and feet do not grow in proportion with her legs and arms, and appear to be more beautifully shaped when contrasted with the more fully developed limb.

With regard to the internal organs, the most important are those of the pelvis. The uterus, or womb, destined to form a safe nest for the protection of the child until it is sufficiently developed to maintain an independent existence, increases greatly in all its dimensions and undergoes certain changes in shape; and the ovaries, which are intended to furnish the ovules, or eggs (the female contribution towards future human beings) also develop both in size and in structure.

Owing to rapid growth and to the want of stability of the young girl's tissues, the years immediately succeeding puberty are not only those of rapid physiological change, but they are those during which irreparable damage may be done unless those who have the care of young girls understand what these dangers are, how they are produced, and how they may be averted.

With regard to the bony skeleton, lateral curvature of the spine is, in mild manifestation, very frequent, and is too common even in the higher degrees. The chief causes of this deformity are:

(1) The natural softness and want of stability in the rapid growing bones and muscles,

(2) The rapid development of the bust, which throws a constantly increasing burden on these weakened muscles and bones, and

(3) The general lassitude noticeable amongst girls at this time, which makes them yield to the temptation to stand on one leg, to cross one leg over the other, and to write or read leaning on one elbow and bending over the table, whereas they ought to be sitting upright. Unless constant vigilance is exerted, deformity is pretty sure to occur, a deformity which always has a bad influence over the girl's health and strength, and which, in those cases where it is complicated by the pathological softness of bones found in cases of rickets, may cause serious alteration in shape, and interfere with the functions of the pelvis in later life.

2. Changes in the Mental Nature.—These are at least as remarkable as the changes in the bodily framework. There is a slight diminution in the power of memorising, but the faculties of attention, of reasoning, and of imagination, develop rapidly. Probably the power of appreciation of the beautiful appears about this time, a faculty which is usually dormant during childhood. More especially is this true with regard to the beauty of landscape; the child seldom enjoys a landscape as such, although isolated beauties, such as that of the flowers, may sometimes be appreciated.

As might be anticipated, all things are changing with the child during these momentous years—its outlook on life, its appreciation of other people and of itself, alter greatly and continuously. The wonderfully rapid growth and alterations in structure of the generative organs have their counterpart in the mental and moral spheres; there are new sensations which are scarcely recognised and are certainly not understood by the subject: vague feelings of unrest, ill-comprehended desires, and an intense self-consciousness take the place of the unconscious egoism of childhood.

The processes of Nature as witnessed in the season of spring have their counterpart in the changes that occur during the early years of adolescence. The earth, warmed by the more direct rays of the sun and softened by recurring showers, is transformed in a few weeks from its bare and dry winter garb into the wonderful beauty of spring. This yearly miracle fails to impress us as it should do because we have witnessed it every year of our lives, and so, too, the great transformation from child to budding woman fails to make its appeal to our understanding and sympathy because it is of so common occurrence. If it were possible for adults to really remember their own feelings and aspirations in adolescent years, or if it were possible for us with enlightened sympathy to gain access to the enchanted garden of youth, we should be more adequate guides for the boys and girls around us. As it is we entirely fail to appreciate the heights of their ambitions, hopes, and joys, and we have no measure with which to plumb the depth of their fears, their disappointments, and their doubts. The transitions between radiant joy and confident hope in the future to a miserable misinterpretation of sensations both physical and psychical are rapid. It is the unknown that is terrible to us all, and to the child the changes in its body, the changes in its soul and spirit, which we pass by as commonplace, are full of suggestions of abnormality, of disaster, and of death. Young people suffer much from the want of comprehension and intelligent sympathy of their elders, much also from their own ignorance and too fervid imagination.

The instability of the bodily tissues and the variability of their functions find a counterpart in the instability of the mental and moral natures and in the variability of their phenomena. Adolescents indeed "never continue in one stay"; left to themselves they will begin many pursuits and persevere with and finish nothing.

Youth is the time for rapidly-succeeding friends, lovers, and heroes. The schoolfellow or teacher who is adored to-day may become the object of indifference or even dislike to-morrow. Ideas as to the calling or profession to be adopted change rapidly, and opinions upon religion, politics, &c. vary from day to day. It is little wonder that there is a special type of adolescent insanity differing entirely from that of later years, one in which, owing to the want of full development of mental faculties, there are no systematised delusions, but a rapid change from depression and melancholy to exaltation bordering on mania. Those parents and guardians who know something of the peculiar physical and mental conditions of adolescence will be best prepared both to treat the troubles wisely, and by sympathy to help the young people under their care to help themselves.

One of the phenomena of adolescence is the dawn of the sexual instinct. This frequently develops without the child knowing or understanding what it means. More especially is this true of young girls whose home life has been completely sheltered, and who have not had the advantage or disadvantage, of that experience of life which comes early to those who live in crowded tenements or amongst the outspoken people of the countryside. The children of the poorer classes have, in a way, too little to learn; they are brought up from babyhood in the midst of all domestic concerns, and the love affairs of their elders are intimately known to them, therefore quite early in adolescence "ilka lassie has her laddie," and although the attraction be short-lived, and the affection very superficial, yet it is sufficient to give an added interest to life, and generally leads to an increased care in dress and an increased desire to make the most of whatever good looks the girl may possess. The girl in richer homes is probably much more bewildered by her unwonted sensations and by the attraction she begins to feel towards the society of the opposite sex.

Probably in these days, when there is more intermingling of the sexes, the girl's outlook is franker, and, so far as this is concerned, healthier, than it was forty or fifty years ago. It is very amusing to elders to hear a boy scarcely in his teens talking of "his best girl," or to see the little lass wearing the colour or ornament that her chosen lad admires. It is true that the "best girl" varies from week to week if not from day to day, but this special regard for a member of the opposite sex announces the dawn of a simple sentiment that will, a few years later, blossom out into the real passion which may fix a life's destiny.

The mental and moral changes that occur during the early years of adolescence call for help and sympathy of an even higher order than do the changes in physical structure and function. Some of these changes, such as shyness and reticence, may be the cause of considerable suffering and perplexity to her elders, but on the whole they are comparatively easy of comprehension, and are more likely to elicit sympathy and kindness than blame. It is far otherwise with such changes as unseemly laughter, rough manners, and a nameless difference in the girl's manner when in the presence of the other sex. A girl who is usually quiet, modest, and sensible in her behaviour suddenly becomes boisterous and self-asserting, there is a great deal of giggling, and altogether a disagreeable transformation which too frequently involves the girl in trouble with her mother or other guardian and is very frequently harshly judged by the child herself. In proportion as discipline has been taught and self-control acquired, these outward manifestations are less marked, but in the case of the great majority of girls there are at any rate impulses having their origin in the yet immature and misunderstood sex impulse which cause the young woman herself annoyance and worry although she is as far from understanding their origin as her elders may be. The remedies for these troubles are various. First in order of time and in importance comes a habit of self-control and self-discipline that ought to be coeval with conscious life. Fathers and mothers are themselves to blame if their girl lapses from good behaviour when they have not inculcated ideals of obedience, duty, and self-discipline from babyhood. It seems such a little thing to let the child have its run of the cake-basket and the sweet-box; it is in the eyes of many parents so unimportant whether the little one goes to bed at the appointed time or ten minutes later; they argue that it can make no difference to her welfare in life or to her eternal destiny whether her obedience is prompt and cheerful or grudging and imperfect. One might as well argue that the proper planting of a seed, its regular watering, and the influences of sun and wind make no difference to the life of a tree. We have to bear carefully in mind that those who sow an act reap a habit, who sow a habit reap a character, who sow a character reap a destiny both in this world and in that which is eternal. It is mere selfishness, unconscious, no doubt, but none the less fatal, when parents to suit their own convenience omit to inculcate obedience, self-restraint, habits of order and unselfishness in their children. Youth is the time when the soul is apt to be shaken by sorrow's power and when stormy passions rage. The tiny rill starting from the mountain side can be readily deflected east or west, but the majestic river hastening to the sea is beyond all such arbitrary directions. So it is with the human being; the character and habit are directed easily in infancy, with difficulty during childhood, but they are well-nigh impossible of direction by the time adolescence is established. Those fathers and mothers who desire to have happiness and peace in connection with their adolescent boys and girls must take the trouble to direct them aright during the plastic years of infancy and childhood. All natural instincts implanted in us by Him who knew what was in the heart of man, are in themselves right and good, but the exercise of these instincts may be entirely wrong in time or in degree. The sexual instinct, the affinity of boy to girl, the love of adult man and woman, are right and holy when exercised aright, and it is the result of "spoiling" when these good and noble instincts are wrongly exercised. All who love their country, all who love their fellow-men, and all who desire that the kingdom of God should come, must surely do everything that is in their power to awaken the fathers and mothers of the land to a sense of their heavy responsibility and of their high privilege. In this we are entirely separated from and higher than the rest of the animal creation, in that on us lies the duty of not only calling into life a new generation of human beings, but also the still higher duty, the still greater privilege and the wider responsibility of bringing up those children to be themselves the worthy parents of the future, the supporters of their country's dignity, and joyful citizens of the household of God.

Another characteristic of adolescence is to be found in gregariousness, or what has been sometimes called the *gang spirit.* Boys, and to almost as great a degree girls, form themselves into companies or gangs, which frequently possess a high degree of organisation. They elaborate special languages, they have their own form of shorthand, their passwords, their rites and ceremonies. The gang has its elected leader, its officers, its members, and although it is liable to sudden disruption and seldom outlasts a few terms of school-life, each succeeding club or company is for the time being of paramount importance in the estimation of its members. The gang spirit may at times cause trouble and lead to anxiety, but if rightly directed it may be turned to good account. It is the germ of the future capacity to organise men and women into corporate life—the very method by which much public work is readily accomplished, but which is impossible to accomplish by individual effort.

3. Changes in the Religion of the Adolescent.—The religion of the adolescent is apt to be marked by fervour and earnest conviction, the phenomenon of "conversion" almost constantly occurring during adolescence. The girl looks upon eternal truths from a completely new standpoint, or at any rate with eyes that have been purged and illuminated by the throes of conversion. From a period of great anxiety and doubt she emerges to a time of intense love and devotion, to an eager desire to prove herself worthy, and to offer a sacrifice of the best powers she possesses. Unfortunately for peace of mind the happy epoch succeeding conversion not infrequently ends in a dismal time of intellectual doubt and spiritual darkness. Just as the embryonic love of the youthful adolescent leads to a time when the opposite sex is rather an object of dislike than of attraction, so the fervour of early conversion is apt to lead to a time of desolation; but just as the incomplete sex love of early adolescence finds its antitype and fine flower in the later fully developed love of honourable man and woman, so does the too rapturous and uncalculating religious devotion of these early years revive after the period of doubt, transfigured and glorified into the religious conviction and devotion which makes the strength, the joy, and the guiding principle of adult life.

Much depends on the circumstances and people surrounding the adolescent. This unbounded capacity for hero-worship leads in many instances to a conscious or unconscious copying of parent, guardian, or teacher, and although the ideals of the young are apt to far outpace those of the adult whose days of illusion are over, yet they are probably formed on the same type. One sees this illustrated by generations in the same family holding much the same religious or political opinions and showing the same aptitude for certain professions, games, and pursuits. Much there is in heredity, but probably there is still more in environment.

OUR DUTIES TOWARDS ADOLESCENT GIRLS

These may be briefly summed up by saying that we have to provide adolescent girls with all things that are necessary for their souls and their bodies, but any such bald and wholesale enunciation of our duty helps but little in clearing one's ideas and in pointing out the actual manner in which we are to perform it.

First, with regard to the bodies of adolescent girls. Their primary needs, just like the primary needs of all living beings, are food, warmth, shelter, exercise, and rest, with special care in sickness.

Food.—In spite of the great advance of knowledge in the present day, it is doubtful whether much practical advance has been made in the dietetics of children and adolescents, and it is to be feared that our great schools are especially deficient in this most important respect. Even when the age of childhood is past, young people require a much larger amount of milk than is usually included in their diet sheet. It would be well for them to begin the day with porridge and milk or some such cereal preparation. Coffee or cocoa made with milk should certainly have the preference over tea for breakfast, and in addition to the porridge or other such dish, fish, egg, or bacon, with plenty of bread and butter, should form the morning repast. The midday meal should consist of fresh meat, fish or poultry, with an abundance of green vegetables and a liberal helping of sweet pudding. The articles of diet which are most deficient in our lists are milk, butter, and sugar. There is an old prejudice against sugar which is quite unfounded so far as concerns the healthy individual. Cane sugar has recently been proved to be a most valuable muscle food, and when taken in the proper way for sweetening beverages, fruit, and puddings, it is entirely good. The afternoon meal should consist chiefly of bread and butter and milk or cocoa, with a fair proportion of simple, well-made cake, and in the case where animal food has been taken both at breakfast and dinner, the evening meal might well be bread and butter, bread and milk, or milk pudding with stewed or fresh fruit. But it is different in the case of those adolescents whose midday meal is necessarily slight, and who ought to have a thoroughly good dinner or supper early in the evening.

One would have thought it unnecessary to mention alcohol in speaking of the dietary of young people were it not that, strange to say, beer is still given at some of our public schools. It is extraordinary that wise and intelligent people should still give beer to young boys and girls at the very time when what they want is strength and not stimulus, food for the growing frame and nothing to stimulate the already exuberant passions.

An invariable rule with regard to the food of children should be that their meals should be regular, that they should consist of good, varied, nourishing food taken at regular hours, and that nothing should be eaten between meals. The practice of eating biscuits, fruit, and sweets between meals during childhood and adolescence not only spoils the digestion and impairs the nutrition at the time, but it is apt to lay the foundation of a constant craving for something which is only too likely to take the form of alcoholic craving in later years. It is impossible for the stomach to perform its duty satisfactorily if it is never allowed to rest, and the introduction of stray morsels of food at irregular times prevents this, and introduces confusion into the digestive work, because there will be in the stomach at the same time food in various stages of digestion.

Warmth.—Warmth is one of the influences essential to health and to sound development, and although artificial warmth is more urgently required by little children and by old people than it is by young adults, still, if their bodies are to come to their utmost possible perfection, they require suitable conditions of temperature. This is provided in the winter partly by artificial heating of houses and partly by the wearing of suitable clothing. Ideal clothing is loose of texture and woven of wool, although a fairly good substitute can be obtained in materials that are made from cotton treated specially.

This is not the time or place in which to insist on the very grave dangers that accompany the use of ordinary flannelette, but a caution must be addressed in passing to those who provide clothing for others. In providing clothes it is necessary to remember the two reasons for their existence: (1) to cover the body, and (2) so far as possible to protect a large area of its surface against undue damp and cold.

Adolescents, as a rule, begin early to take a great interest in their clothes. From the time that the appreciation of the opposite sex commences, the child who has hitherto been indifferent or even slovenly in the matter of clothing, takes a very living interest in it; indeed the adornment of person and the minute care devoted to details of the toilet by young people of both sexes remind one irresistibly of the preening of the feathers, the strutting and other antics of birds before their mates.

Girls especially are apt to forget the primary object of clothing, and to think of it too much as a means of adornment. This leads to excesses and follies such as tight waists, high-heeled shoes, to the ungainly crinoline or to indecent scantiness of skirts. Direct interference in these matters is badly tolerated, but much may be accomplished both by example and by cultivating a refined and artistic taste in sumptuary matters.

Sleep.—Amongst the most important of the factors that conduce to well-being both of body and mind must be reckoned an adequate amount of sleep. This has been made the subject of careful inquiry by Dr. Dukes of Rugby and Miss Alice Ravenhill. Both these trained and careful observers agree that the majority of young people get far too little rest and sleep. We have to remember that although fully-grown adults will take rest when they can get it in the daytime, young people are too active, and sometimes too restless, to give any repose to brain or muscle except during sleep. In the early years of adolescence ten hours' sleep is none too much; even an adult in full work ought to have eight hours, and still more is necessary for the rapidly-growing, continually-developing, and never-resting adolescent. It is unfortunately a fact that even in the boarding-schools of the well-to-do the provision of sleep is too limited, and for the children of the poor whose homes are far from comfortable and who are accustomed to doing pretty nearly as their elders do, the night seldom begins before eleven or even twelve o'clock. It is one of the saddest sights of London to see small children dancing on the pavement in front of the public-houses up to a very late hour, while groups of loafing boys and hoydenish girls stand about at the street corners half the night. There is little wonder that the morning finds them heavy and unrefreshed, and that schoolwork suffers severely from want of the alert and vigorous attention that might be secured by a proper night's sleep.

Great harm is done by allowing children to take work home with them from school; if possible the day's work should finish with the school hours, and the scanty leisure should be spent in healthy exercise or in sleep.

Overcrowding.—In considering the question of adequate sleep it would be well to think of the conditions of healthy sleep.

For sleep to be refreshing and health-giving, the sleeper ought to have a comfortable bed and an abundant supply of fresh air. Unfortunately the great majority of our people both in town and country do not enjoy these advantages. In both town and country there is a great deficiency of suitable dwellings at rents that can be paid with the usual rate of wages. In consequence families are crowded into one, two, or three rooms, and even in the case of people far above the status of day labourers and artisans it is the exception and not the rule for each individual to have a separate bed. The question of ventilation is certainly better understood than it was a few years ago, but still leaves much to be desired, and there is still an urgent necessity for preaching the gospel of the open window.

Exercise.—In considering the question of the exercise of adolescents, one's thoughts immediately turn to athletics, games, and dancing. As a nation the English have always been fond of athletics, and have attributed to the influence of such team games as cricket and football not only their success in various competitions but also their success in the sterner warfare of life. This success has been obtained on the tented field and in the work of exploring, mountaineering, and other pursuits that make great demand not only on nerve and muscle but also on strength of character and powers of endurance.

Team games appear to be the especial property of adolescents, for young children are more or less individualistic and solitary in many of their games, but boys and girls alike prefer team games from the pre-adolescent age up to adult life. It is certain that no form of exercise is superior to these games; they call into play every muscle of the body, they make great demands on accuracy of eye and co-ordination, they also stimulate and develop habits of command, obedience, loyalty, and *esprit de corps*. In the great public schools of England, and in the private schools which look up to them as their models, team games are played as one might say in a religious spirit. The boy or girl who attempts to take an unfair advantage or who habitually plays for his or her own hand, is quickly made to feel a pariah and an outcast. Among the greatest blessings that are conveyed to the children of the poorer classes is the instruction not only in the technique of team games but also in the inoculation of the spirit in which they ought to be played. It is absolutely necessary that the highest ideals connected with games should be handed down, for thus the children who perhaps do not always have the highest ideals before them in real life may learn through this mimic warfare how the battle of life must be fought and what are the characters of mind and body that deserve and ensure success. It has been well said that those who make the songs of a nation help largely to make its character, and equally surely those who teach and control the games of the adolescents are making or marring a national destiny.

Among the means of physical and moral advancement may be claimed gymnastics. And here, alas, this nation can by no means claim to be *facile princeps*. Not only have we been relatively slow in adopting properly systematised exercises, but even to the present day the majority of elementary schools are without properly fitted gymnasia and duly qualified teachers. The small and relatively poor Scandinavian nations have admirably fitted gymnasia in connection with their *Folkschule*, which correspond to our elementary schools. The exercises are based on those systematised by Ling; each series is varied and is therefore the more interesting, and each lesson commences with simple, easily performed movements, leading on to those that are more elaborate and fatiguing, and finally passing through a descending series to the condition of repose.

The gymnasia where such exercises are taught in England are relatively few and far between, and it is lamentable to find that many excellent and well-appointed schools for children whose parents pay large sums of money for their education have no properly equipped gymnasia nor adequately trained teachers. When the question is put, "How often do you have gymnastics at your school?" the answer is frequently, "We have none," or, "Half an hour once a week." Exercises such as Ling's not only exercise every muscle in the body in a scientific and well regulated fashion, but being performed by a number of pupils at once in obedience to words of command, discipline, co-operation, obedience to teachers, and loyalty to comrades, are taught at the same time. The deepest interest attaches to many of the more complex exercises, while some of them make large demands on the courage and endurance of the young people.

Again, in Scandinavia the State provides knickerbockers, tunics, and gymnasium shoes for those children whose parents are too poor to provide them, and again, in Scandinavia there is very frequently the provision of bathrooms in which the pupils can have a shower bath and rub-down after the exercises. These bathrooms in connection with the gymnasia need not necessarily be costly, indeed many of them in Stockholm and Denmark merely consist of troughs in the cement floor, on the edge of which the children sit in a row while they receive a shower bath over their heads and bodies. The feet get well washed in the trough, and the smart douche of water on head and shoulders acts as an admirable tonic.

Another exercise which ought to be specially dear to a nation of islanders is swimming, and this again is a relatively cheap luxury too much neglected amongst us. Certainly there are public baths, but there are not enough to permit of all the elementary school-children bathing even once a week, and still less have they the opportunity of learning to swim. There is much to be done yet before we can be justly proud of our national system of education. We must not lose sight of the ideal with which we started, viz. that we should endeavour to do the best that is possible for our young people in body, soul, and spirit. The three parts of our nature are intertwined, and a duty performed to one part has an effect on the whole.

CARE OF THE ADOLESCENT GIRL IN SICKNESS

If measured by the death-rate the period of adolescence should cause us little anxiety, but a careful examination into the state of health of children of school age shows us that it is a time in which disorders of health abound, and that although these disorders are not necessarily, nor even generally, fatal, they are frequent, they spoil the child's health, and inevitably bear fruit in the shape of an injurious effect on health in after life.

That the health of adolescents should be unstable is what we ought to expect from the general instability of the organism due to the rapidity of growth and the remarkable developmental changes that are crowded into these few years. Rapidity of growth and increase of weight are very generally recognised, although their effects upon health are apt to be overlooked. On the other hand, the still more remarkable development that occurs in adolescence is very generally ignored.

As a general rule the infectious fevers, the so-called childish diseases, such as measles, chicken-pox, and whooping-cough, are less common in adolescence than they are in childhood, while the special diseases of internal organs due to their over-work, or to their natural tendency to degeneration, is yet far in the future. The chief troubles of adolescents appear to be due to over-stress which accompanies rapid development, to the difficulty of the whole organism in adapting itself to new functions and altered conditions, and no doubt in some measure to the unwisdom both of the young people and of their advisers.

This is not the place for a general treatise on the diseases of adolescents, but a few of the commonest and most obvious troubles should be noted.

The Teeth.—It is quite surprising to learn what a very large percentage of young men are refused enlistment on account of decayed or defective teeth, and anyone who has examined the young women candidates for the Civil Service and for Missionary Societies must have recognised that their teeth are in no way better than those of the young men. In addition to several vacancies in the dental series it is by no means unusual to find that a candidate has three, or even five teeth severely decayed. The extraordinary thing is that not only the young people and their parents very generally fail to recognise the gravity of this condition, but that even their medical advisers have frequently acquiesced in a state of things that is not only disagreeable but dangerous. A considerable proportion of people with decayed teeth have also suppuration about the margins of the gums and around the roots of the teeth. This pyorrhœa alveolaris, as it is called, constitutes a very great danger to the patient's health, the purulent discharge teems with poisonous micro-organisms, which being constantly swallowed are apt to give rise to septic disease in various organs. It is quite probable that some cases of gastric ulcer are due to this condition, so too are some cases of appendicitis, it has been known to cause a peculiarly fatal form of heart disease, and it is also responsible for the painful swelling of the joints of the fingers, with wasting of the muscles and general weakness which goes by the name of rheumatoid arthritis. In addition to this there are many local affections, such as swollen glands in the neck, that may be due to this poisonous discharge. One would think that the mere knowledge that decayed teeth can cause all this havoc would lead to a grand rush to the dentist, but so far from being the case, doctors find it extremely difficult to induce their patients to part with their unsightly, evil-smelling, and dangerous decayed teeth.

The Throat.—Some throat affections, such as diphtheria and quinsy, are well known and justly dreaded, and although many a child's life has been sacrificed to the slowness of its guardians to procure medical advice and the health-restoring antitoxin, yet on the whole the public conscience is awake to this duty. Far otherwise is it with chronic diseases of the tonsils; they may be riddled with small cysts, they may be constantly in a condition of sub-acute inflammation dependent on a septic condition, but no notice is taken except when chill, constipation, or a general run-down state of health aggravates the chronic into a temporary acute trouble. And yet it is perhaps not going too far to say that for one young girl who is killed or invalided rapidly by diphtheria there are hundreds who are condemned to a quasi-invalid life owing to this persistent supply of poison to the system.

Another condition of the throat which causes much ill-health is well known to the public under the name of adenoids. Unfortunately, however, many people have an erroneous idea that children will grow out of adenoids. Even if this were true it is extremely unwise to wait for so desirable an event. Adenoids may continue to grow, and during the years that they are present they work great mischief. Owing to the blocking of the air passages the mouth is kept constantly open, greatly to the detriment of the throat and lungs. Owing to the interference with the circulation at the back of the nose and throat, a considerable amount both of apparent and real stupidity is produced, the brain works less well than it ought, and the child's appearance is ruined by the flat, broad bridge of the nose and the gaping mouth. The tale of troubles due to adenoids is not even yet exhausted; a considerable amount of discharge collects about them which it is not easy to clear away, it undergoes very undesirable changes, and is then swallowed to the great detriment of the stomach and the digestion. The removal of septic tonsils and of adenoids is most urgently necessary, and usually involves little distress or danger. The change in the child's health and appearance that can thus be secured is truly wonderful, especially if it be taught, as it should be, to keep its mouth shut and to breathe through the nose. In the course of a few months the complexion will have cleared, the expression will have regained its natural intelligence, digestion will be well performed, and the child's whole condition will be that of alert vigour instead of one of listless and sullen indifference.

Errors of Digestion.—From the consideration of certain states of the nose, mouth, and throat, it is easy to turn to what is so often their consequence. Many forms of indigestion are due to the septic materials swallowed. It would not, however, be fair to say that all indigestion is thus caused; not infrequently indigestion is due to errors of diet, and here the blame must be divided between the poverty and ignorance of many parents and the self-will of adolescents. The foods that are best for young people, such as bread, milk, butter, sugar, and eggs, are too frequently scarce in their dietaries owing to their cost, and again, in the case of many girls whose parents are able and willing to provide them with a thoroughly satisfactory diet-sheet, dyspepsia is caused by their refusal to take what is good for them, and by their preference for unsuitable and indigestible viands.

A further cause of indigestion must be sought in the haste with which food is too often eaten. The failure to rise at the appointed time leads to a hasty breakfast, and this must eventually cause indigestion. The food imperfectly masticated and not sufficiently mixed with saliva enters the stomach ill-prepared, and the hasty rush to morning school or morning work effectually prevents the stomach from satisfactorily dealing with the mass so hastily thrust into it.

There is an old saying that "Those whom the gods will destroy they first make mad," and in many instances young people who fall victims to the demon of dyspepsia owe their sorrows, if not to madness, at any rate to ignorance and want of consideration. The defective teeth, septic tonsils, discharging adenoids, poverty of their parents and their own laziness, all conspire to cause digestive troubles which bear a fruitful crop of further evils, for thus are caused such illnesses as anæmia and gastric ulcer.

Constipation claims a few words to itself. And here again we are brought to consider certain septic processes. The refuse of the food should travel along the bowels at a certain rate, but if owing to sluggishness of their movements or to defects in the quality and amount of their secretion, they are too long retained the masses become unduly dry, and, constantly shrinking in volume, are no longer capable of being urged along the tube at the proper rate. In consequence of this the natural micro-organisms of the intestine cease to be innocent and become troublesome; they lead in the long run to a peculiar form of blood-poisoning, and to so many diseased conditions that it is impossible to deal with them at the present moment.

The existence of constipation is too often a signal for the administration of many doses of medicine. The wiser, the less harmful, and the more effectual method of dealing with it would be to endeavour to secure the natural action of the bowels by a change in the diet, which should contain more vegetable and less animal constituents. The patient should also be instructed to drink plenty of water, either hot or cold, a large glassful on going to bed and one on first awaking, and also if necessary an hour before each meal. Steady exercise is also of great service, and instead of starting so late as to have no time for walking to school or work, a certain portion of the daily journey should be done on foot. Further, in all cases where it is possible, team games, gymnastics, and dancing should be called in to supplement the walk.

Headache.—Headache may be due to so many different causes that it would be impossible in this article to adequately consider them, but it would not be fair to omit to mention that in many cases the headache of young people is due to their want of spectacles. The idea that spectacles are only required by people advanced in life is by this time much shaken, but even now not only many parents object to their children enjoying this most necessary assistance to imperfect vision, but also employers may be found sufficiently foolish and selfish to refuse to employ those who need to wear glasses. The folly as well as selfishness of this objection is demonstrated by the far better work done by a person whose vision has been corrected, and the absolute danger incurred by all who have to deal with machinery if vision is imperfect. Among other causes for headache are the defects of mouth, throat, stomach, and bowels already described, because in all of them there is a supply of septic material to the blood which naturally causes headache and other serious symptoms.

Abnormalities of Menstruation.—The normal period should occur at regular intervals about once a month. Its duration and amount varies within wide limits, but in each girl it should remain true to her individual type, and it ought not to be accompanied by pain or distress. As a rule the period starts quite normally, and it is not until the girl's health has been spoiled by over-exertion of body or mind, by unwise exertion during the period, or by continued exposure to damp or cold, that it becomes painful and abnormal in time or in amount.

One of the earliest signs of approaching illness, such as consumption, anæmia, and mental disorder, is to be found in the more or less sudden cessation of the period. This should always be taken as a danger-signal and as indicating the need of special medical advice.

Another point that should enter into intimate talk with girls is to make them understand the co-relation of their own functions to the great destiny that is in store. A girl is apt to be both shocked and humiliated when she first hears of menstruation and its phenomena. Should this function commence before she is told about it, she will necessarily look upon it with disgust and perhaps with fear. It is indeed a most alarming incident in the case of a girl who knows nothing about it, but if, before the advent of menstruation, it be explained to her that it is a sign of changes within her body that will gradually, after the lapse of some years, fit her also to take her place amongst the mothers of the land, her shame and fear will be converted into modest gladness, and she will readily understand why she is under certain restrictions, and has at times to give up work or pleasure in order that her development may be without pain, healthy, and complete.

MENTAL AND MORAL TRAINING

The years of adolescence, during which rapid growth and development inevitably cause so much stress and frequently give rise to danger, are the very years in which the weight of school education necessarily falls most heavily. The children of the poor leave school at fourteen years of age, just the time when the children of the wealthier classes are beginning to understand the necessity of education and to work with a clearer realisation of the value and aim of lessons. The whole system of education has altered of late years, and school work is now conducted far more intelligently and with a greater appreciation of the needs and capacities of the pupils than it was some fifty years ago. Work is made more interesting, the relation of different studies to each other is more adequately put in evidence, and the influence that school studies have on success in after life is more fully realised by all concerned. The system of training is, however, far from perfect. In the case of girls more particularly, great care has to be exercised not to attempt to teach too much, and to give careful consideration to the physiological peculiarities of the pupils. It is impossible for girls who are undergoing such rapid physiological and psychical changes to be always equally able and fit for strenuous work. There are days in every girl's life when she is not capable of her best work, and when a wise and sympathetic teacher will see that it is better for her to do comparatively little. And yet these slack times are just those in which there is the greatest danger of a girl indulging in day-dreams, and when her thoughts need to be more than usually under control. These times may be utilised for lighter subjects and for such manual work as does not need great physical exertion. It is not a good time for exercises, for games, for dancing, and for gardening, nor are they days on which mathematics should be pressed, but they are days in which much supervision is needed, and when time should not be permitted to hang heavily on hand.

Just as there are days in which consideration should be shown, so too there are longer periods of time in which it is unwise for a girl to be pressed to prepare for or to undergo a strenuous examination. The brain of the girl appears to be as good as that of the boy, while her application, industry, and emulation are far in advance of his, but she has these physiological peculiarities, and if they are disregarded there will not only be the occasional disastrous failure in bodily or mental health, but girls as a class will fail to do the best work of which they are capable, and will fail to reap the fullest advantage from an education which is costly in money, time, and strength.

It follows that the curriculum for girls presents greater difficulties than the curriculum for boys, and that those responsible for the organisation of a school for girls need to be women of great resource, great patience, and endowed with much sympathetic insight. The adolescent girl will generally do little to help her teachers in this matter. She is incapable of recognising her own limitations, she is full of emulation, and is desirous of attaining and keeping a good position not only in her school but also in the University or in any other public body for whose examination she may present herself. The young girl most emphatically needs to be saved from herself, and she has to learn the lessons of obedience and of cheerful acquiescence in restrictions that certainly appear to her simply vexatious.

One of the difficulties in private schools arises from the necessity of providing occupation for every hour of the waking day while avoiding the danger of overwork with its accompanying exhaustion. In the solution of this problem such subjects as gymnastics, games, dancing, needlework, cooking, and domestic economy will come in as a welcome relief from the more directly intellectual studies, and equally as a relief to the conscientious but hard-pressed woman who is trying to save her pupils from the evils of unoccupied time on the one hand and undue mental pressure on the other.

Boys, and to a less extent girls, attending elementary schools who leave at fourteen are not likely to suffer in the same way or from the same causes. One of the difficulties in their case is that they leave school just when work is becoming interesting and before habits of study have been formed, indeed before the subjects taught have been thoroughly assimilated, and that therefore in the course of a few years little may be left of their painfully acquired and too scanty knowledge. Free education has been given to the children of the poor for more than forty years, and yet the mothers who were schoolgirls in the seventies and eighties appear to have saved but little from the wreck of their knowledge except the power to sign their names and to read a little in an imperfect and blundering manner.

Here, too, there are many problems to be solved, one among them being the great necessity of endeavouring to correlate the lessons given in school to the work that the individual will have to perform in after life. It would appear as if the girls of the elementary schools, in addition to reading, writing, and simple arithmetic, sufficient to enable them to write letters, to read books, and to keep simple household accounts, ought to be taught the rudiments of cookery, the cutting out and making of garments, and the best method of cleansing as applied to household utensils and clothing. In addition, and as serious subjects, not merely as a recreation, they should be taught gymnastics and part singing. No doubt in individual schools much of this modification of the curriculum has been accomplished, but more remains to be done before we can be satisfied that we have done the best in our power to fit the children of the country for their life's work.

Another of the great problems connected with the children in elementary schools, a problem which, indeed, arises out of their leaving at fourteen, is that of the Continuation School or Evening School, and the system which is known as "half-timing." It is well known that although young people from fouteeen to sixteen years of age are well able to profit by continued instruction, they are, with very few exceptions, not at all well adapted for commencing their life's work as industrials. The general incoherency and restlessness peculiar to that age frequently lead to a change of employment every few months, while the general irresponsibility and want of self-control natural to the age lead to frequent disputes with foremen and other officials in factories and shops, in consequence of which the unfortunate child is constantly out of work. In proportion to the joy and pride caused by the realised capacity to earn money and by the sense of independence that employment brings, is the unhappiness, and in many cases the misery, due to unemployment, and to repeated failures to obtain and to keep an independent position. The boy or girl out of work has an uneasy feeling that he or she has not earned the just and expected share towards household expenses. The feeling of dependence and well-nigh of disgrace causes a rapid deterioration in health and spirits, and it is only too likely that in many instances where unemployment is continuous or frequently repeated, the unemployed will quickly become the unemployable.

So far as the young themselves are concerned, it would be nearly always an unmixed benefit that they should pass at fourteen into a Technical School or Continuation School, as the case might be. Among the great difficulties to the solution of this problem is the fact that in many working-class households the few weekly shillings brought into the family store by the elder children are of very real importance, and although the raising of the age of possible employment and independence would enable the next generation to work better and to earn higher and more continuous wages, it is difficult for the parents to acquiesce in the present deprivation involved, even though it represents so much clear gain in the not distant future.

At the present time there are Evening Schools, but this system does not work well. All busy people are well aware that after a hard day's work neither brain nor body are in the best possible condition for two or three hours of serious mental effort. The child who has spent the day in factory or shop has really pretty nearly used up all his or her available mental energy, and after the evening meal is naturally heavy, stupid, irritable, and altogether in a bad condition for further effort. The evenings ought to be reserved for recreation, for the gymnasium, the singing class, the swimming bath, and even for the concert and the theatre.

The system of "half-timing" during ordinary school life does not work well, and it would be a great pity should a similar system be introduced in the hope of furthering the education of boys and girls who are just entering industrial life.

Another subject to which the attention of patriots and philanthropists ought to be turned is the sort of employment open to children at school-leaving age. The greatest care should be taken to diminish the number of those who endeavour to achieve quasi-independence in those occupations which are well known as "blind alleys." In England it is rare that girls should seek those employments, but in Scotland there is far too large a number of girl messengers. In this particular, the case of the girl is superior to that of the boy. The "tweeny" develops into housemaid or cook; the young girls employed in superior shops to wait on the elder shopwomen hope to develop into their successors, and the girls who nurse babies on the doorsteps are, after all, acquiring knowledge and dexterity that may fit them for domestic service or for the management of their own families a few years later.

The girls of the richer classes have not the same difficulties as their poorer sisters. They generally remain at school until a much later age, and subsequently have the joy and stimulus of college life, of foreign travel, of social engagements, or of philanthropic enterprise. Still, a residue remains even of girls of this class whose own inclinations, or whose family circumstances, lead to an aimless, purposeless existence, productive of much injury to both body and mind, and only too likely to end in hopeless ennui and nervous troubles. It should be thoroughly understood by parents and guardians that no matter what the girl's circumstances may be, she ought always to have an abundance of employment. The ideas of obligation and of duty should not be discarded when school and college life cease. The well-to-do girl should be encouraged to take up some definite employment which would fill her life and provide her with interests and duties. Any other arrangement tends to make the time between leaving school or college and a possible marriage not only a wasted time but also a seed-time during which a crop is sown of bad habits, laziness of body, and slackness of mind, that subsequently bear bitter fruit. It is quite time for us to recognise that unemployment and absence of duties is as great a disadvantage to the rich as it is to the poor; the sort of employment must necessarily differ, but the spirit in which it is to be done is the same.

One point that one would wish to emphasize with regard to all adolescents is that although occupation for the whole day is most desirable, hard work should occupy but a certain proportion of the waking hours. For any adolescent, or indeed for any of us to attempt to work hard for twelve or fourteen hours out of the twenty-four is to store up trouble. It is not possible to lay down any hard and fast rule as to the length of hours of work, because the other factors in the problem vary so greatly. One person may be exhausted by four hours of intellectual effort, whereas another is less fatigued by eight, and further the daily occupations vary greatly in the demand that they make on attention and on such qualities as reason, judgment, and power of initiation. Those who teach or learn such subjects as mathematics, or those who are engaged in such occupations as portrait-painting and the higher forms of musical effort, must necessarily take more out of themselves than those who are employed in feeding a machine, in nursing a baby, or in gardening operations.

THE FINAL AIM OF EDUCATION

The great problem before those who have the responsibility for the training of the young is that of preparing them to take their place in the world as fathers, mothers, and citizens, and among the fundamental duties connected with this responsibility must come the placing before the eyes of the young people high ideals, attractive examples, and the securing to them the means of adequate preparation. As a nation it seems to be with us at present as it was with the people of Israel in the days of Eli: "the word of the Lord was precious (or scarce) in those days; there was no open vision." We seem to have come to a time of civilisation in which there is much surface refinement and a widespread veneer of superficial knowledge, but in which there is little enthusiasm and in which the great aim and object of teaching and of training is but too little realised. In the endeavour to know a little of all things we seem to have lost the capacity for true and exhaustive knowledge of anything. It would appear as if the remedy for this most unsatisfactory state of things has to commence long before the years of adolescence, even while the child is yet in its cradle. The old-fashioned ideas of duty, obedience, and discipline must be once more household words and living entities before the race can enter on a period of regeneration. We want a poet with the logic of Browning, the sweetness of Tennyson, and the force of Rudyard Kipling, to sing a song that would penetrate through indifference, sloth, and love of pleasure, and make of us the nation that we might be, and of which the England of bygone years had the promise.

Speaking specially with regard to girls, let us first remember that the highest earthly ideal for a woman is that she should be a good wife and a good mother. It is not necessary to say this in direct words to every small girl, but she ought to be so educated, so guided, as to instinctively realise that wifehood and motherhood is the flower and perfection of her being. This is the hope and ideal that should sanctify her lessons and sweeten the right and proper discipline of life. All learning, all handicraft, and all artistic training should take their place as a preparation to this end. Each generation that comes on to the stage of life is the fruit of that which preceded it. It is the flower of the present national life and the seed of that which is to come. We ought to recognise that all educational aims and methods are really subordinate to this great end; if this were properly realised by adolescents it would be of the greatest service and help in their training. The deep primal instinct of fatherhood and motherhood would help them more than anything else to seek earnestly and successfully for the highest attainable degree of perfection of their own bodies, their own minds, and their own souls. It is, however, impossible to aim at an ideal that is unseen and even unknown, and although the primal instinct exists in us, all its fruition is greatly hindered by the way in which it is steadily ignored, and by the fact that any proclamation of its existence is considered indiscreet and even indelicate. How are children to develop a holy reverence for their own bodies unless they know of their wonderful destiny? If they do not recognise that at least in one respect God has confided to them in some measure His own creative function, how can they jealously guard against all that would injure their bodies and spoil their hopes for the exercise of this function? There is, even at the present time, a division of opinion as to when and in what manner children are to be made aware of their august destiny. We are indeed only now beginning to realise that ignorance is not necessarily innocence, and that knowledge of these matters may be sanctified and blessed. It is, however, certain that the conspiracy of silence which lasted so many years has brought forth nothing but evil. If a girl remains ignorant of physiological facts, the shock of the eternal realities of life that come to her on marriage is always pernicious and sometimes disastrous. If, on the other hand, such knowledge is obtained from servants and depraved playfellows, her purity of mind must be smirched and injured.

Even among those who hold that children ought to be instructed, there is a division of opinion as to when this instruction is to begin. Some say at puberty, others a few years later, perhaps on the eve of marriage, and yet others think that the knowledge will come with less shock, with less personal application, and therefore in a more natural and useful manner from the very beginning of conscious life. These last would argue—why put the facts of reproduction on a different footing from those of digestion and respiration? As facts in the physical life they hold a precisely similar position. Upon the due performance of bodily functions depends the welfare of the whole organism, and although reproduction, unlike the functions of respiration and digestion, is not essential to the life of the individual, it is essential to the life of the nation.

The facts of physiology are best taught to little children by a perfectly simple recognition of the phenomena of life around them—the cat with her kittens, the bird with its fledgelings, and still more the mother with her infant, are all common facts and beautiful types of motherhood. Instead of inventing silly and untrue stories as to the origin of the kitten and the fledgeling, it is better and wiser to answer the child's question by a direct statement of fact, that God has given the power to His creatures to perpetuate themselves, that the gift of Life is one of His good gifts bestowed in mercy on all His creatures. The mother's share in this gift and duty can be observed by and simply explained to the child from its earliest years; it comes then with no shock, no sense of shame, but as a type of joy and gladness, an image of that holiest of all relations, the Eternal Mother and the Heavenly Child.

Somewhat later in life, probably immediately before puberty in boys and shortly after puberty in girls, the father's share in this mystery may naturally come up for explanation. The physiological facts connected with this are not so constantly in evidence before children, and therefore do not press for explanation in the same way as do those of motherhood, but the time comes soon in the schoolboy's life when the special care of his own body has to be urged on him, and this knowledge ought to come protected by the sanction that unless he is faithful to his trust he cannot look to the reward of a happy home life with wife and children. In the case of the girl the question as to fatherhood is more likely to arise out of the reading of the Bible or other literature, or by her realisation that at any rate in the case of human parenthood there is evidently the intermediation of a father. The details of this knowledge need not necessarily be pressed on the adolescent girl, but it is a positive cruelty to allow the young woman to marry without knowing the facts on which her happiness depends.

Another way in which the mystery of parenthood can be simply and comfortably taught is through the study of vegetable physiology. The fertilisation of the ovules by pollen which falls directly from the anthers on to the stigma can be used as a representation of similar facts in animal physiology. It is very desirable, however, that this study of the vegetable should succeed and not precede that of the domestic animals in the teaching of boys and girls.

Viewed from this standpoint there is surely no difficulty to the parent in imparting to the child this necessary knowledge. We have to remember that children have to know the mysteries of life. They cannot live in the world without seeing the great drama constantly displayed to them in family life and in the lives of domesticated animals. They cannot read the literature of Greece and Rome, nay, they cannot study the Book of Books, without these facts being constantly brought to mind. A child's thirst for the interpretation of this knowledge is imperative and insatiable—not from prurience nor from evil-mindedness, but in obedience to a law of our nature, the child demands this knowledge—and will get it. It is for fathers and mothers to say whether these sublime and beautiful mysteries shall be lovingly and reverently unveiled by themselves or whether the child's mind shall be poisoned and all beauty and reverence destroyed by depraved schoolfellows and vulgar companions.

In the hope of securing the purity, reverence, and piety of our children, in the hope that they may grow up worthy of their high destiny, let us do what we may to keep their honour unsmirched, to preserve their innocence, and to lead them on from the unconscious goodness of childhood to the clear-eyed, fully conscious dignity of maturity, that our sons may grow up as young plants, and our daughters as the polished corners of the temple.

MARY SCHARLIEB, M.D., M.S.

PART II: BOYS

PREFACE

It is with much reluctance that I submit the following pages to the Public in the very crude form in which they leave my pen. The editor asked me to do in haste a task which another had been unable to complete at leisure. Possibly I was unwise to undertake so difficult a task, but the opportunity which the editor offered me of hastening a social reform of transcendent importance was not to be refused, and, in the small leisure which a busy schoolmaster can command during three weeks of term, I have put together the following pages.

An appeal on this subject was made to the public years ago by one of the most distinguished of living teachers. I strongly advise those who are interested in the subject to read this appeal—*The Training of the Young in Laws of Sex*, by the Rev. the Hon. E. Lyttelton, Headmaster of Eton. I feel it almost an impertinence to praise a work the spiritual insight and literary charm of which speak so eloquently for themselves.

Public attention was still earlier called to the subject] by Dr. Clement Dukes of Rugby, the well-known writer on school hygiene. Teachers hardly need to be advised to read *Health at School*, in which the vital importance of purity-teaching is very ably insisted upon. I am indebted to Dr. Dukes for his kindness in lending me an earlier book of his which is now out of print.

Crude as is the work which I have accomplished, it will, I trust, carry conviction to many minds of the urgent need for purity-teaching to the young, and will thus forward a cause to which I have given some of the best energies of my life.

Great diversity of opinion exists as to the best method of giving this instruction, and those who have had experience of one method are curiously blind to the merits of other methods—which they usually strongly denounce. While I have my own views as to the best methods to adopt, I am quite sure that each one of very many methods can, in suitable hands, produce great good, and that the very poorest method is infinitely superior to no method at all.

Some are for oral teaching, some for the use of a pamphlet, some favour confidential individual teaching, others collective public teaching. Some would try to make sex a sacred subject; some would prefer to keep the emotional element out and treat reproduction as a matter-of-fact science subject. Some wish the parent to give the teaching, some the teacher, some the doctor, some a lecturer, specially trained for this purpose. Good results have been obtained by every one of these methods.

I warned the editor that, if I undertook the work, I should be frank, and I fear that some of my readers may think me indelicately so. Vague and ambiguous writing is out of place on a subject of such supreme importance. The time will, I hope, come when public discussion of sex questions is needless, but no improvement on present conditions is possible until there has been much plain speaking.

By the advice of the general editor of the series, I have used the first person singular throughout the following chapters. Though critics will no doubt find in this, as in many other matters, material for caustic criticism, I have adopted the plan chiefly from a sense of my inability, as a tyro in public writing, to express my ideas clearly in the conventional manner.

I trust that those who share my ideals and who sympathise with my efforts will be indulgent towards my blunders.

INTRODUCTORY NOTE

The term puberty will so often be used in the following pages that a brief account of the phenomena of puberty may appropriately be given at the outset of this work. Puberty is a name given to the age at which a boy becomes capable of being a father. In temperate climates this age is reached at about fifteen years, though some boys attain it at twelve and some not until seventeen. The one obvious and invariable sign of puberty is a change of pitch in the voice which assumes its bass character after an embarrassing period of squeaky alternations between the high and low tones.

The age is a critical one, as several important changes take place in body and in mind. The reproductive organs undergo considerable development and become sensitive to any stimulus, physical or mental. The seminal fluid which in normal cases has hitherto been secreted little, if at all, is now elaborated by the testicles, and contains spermatazoa—minute organisms which are essential to reproduction. Under the stimulus of sexual thoughts this fluid is secreted in such quantity as to give rise to involuntary discharge during sleep. These nocturnal emissions are so often found among boys and young men that some physiologists consider them to be quite normal. My experience leads me to doubt this conclusion.

Another physical change associated with puberty is the growth of hair on the pubes and on the face: in this latter situation the growth is slow.

With the capacity for fatherhood comes a very strong awakening of the sexual instinct which manifests itself in passion and in lust—the unconscious and the conscious sex hunger. The passion shows itself in a ludicrously indiscriminate and exaggerated susceptibility to female attractions—a susceptibility the sexual character of which is usually quite unrecognised. Among the boys who have sex knowledge there is also a tendency to dwell on sexual thoughts when the mind is not otherwise occupied. Passion and lust do not at once develop their full strength; but, coming at a time when self-control is very weak and coming with all the attraction of novelty, they often dominate the mind even in normal cases, and may become tyrannous when the reproductive system has been prematurely stimulated.

A heightened self-consciousness and an antagonism to authority so often follow the attainment of puberty that they are usually considered to be its results. My own experience with boys satisfies me that this conclusion is not correct. Self-consciousness, when it occurs in boyhood, is usually the result of an unclean inner life. Puberty merely increases the self-consciousness by intensifying its cause. When the mind is clean there is no marked change in this respect at puberty. The antagonism to authority so often observed after puberty is the product of unsatisfactory external influences. With puberty the desire to stand well with others, and in particular the desire to seem manly, increases. If a debased public opinion demands of a boy the cheap manliness of profanity, tobacco, and irreverence, the demand creates a plentiful supply, while it also suppresses as priggish or "pi" any avowed or suspected devotion to higher ideals. A healthy public opinion, working in harmony with a boy's nobler instincts, calls forth in him an earnest devotion to high ideals, and causes him to exercise, on the development of his powers and in a crusade against wrong, the new energies which a wholesome puberty places at his disposal.

PREVALENCE OF IMPURITY AMONG BOYS: THE AUTHOR'S OWN EXPERIENCE

Of the perils which beset the growing boy all are recognised, and, in a measure, guarded against except the most inevitable and most fatal peril of all. In all that concerns the use and abuse of the reproductive organs the great majority of boys have hitherto been left without adult guidance, and have imbibed their ideas from the coarser of their companions and from casual references to the subject in the Bible and other books. Under these conditions very few boys escape two of the worst dangers into which it is possible for a lad to fall—the artificial stimulation of the reproductive organs and the acquisition of degraded ideas on the subject of sex. That many lives are thus prematurely shortened, that many constitutions are prematurely enfeebled, that very many lads who might otherwise have striven successfully against the sexual temptations of adult life succumb—almost without a struggle—to them, can be doubted by no one who is familiar with the inner life of boys and men.

Of these two evils, self-abuse, though productive of manifold and disastrous results, is distinctly the less. Many boys outgrow the physical injuries which, in ignorance, they inflict upon themselves in youth; but very few are able wholly to cleanse themselves from the foul desires associated in their minds with sex. These desires make young men impotent in the face of temptation. Under their evil dominance, even men of kind disposition will, by seduction, inflict on an innocent girl agony, misery, degradation, and premature death. They will indulge in the most degrading of all vices with prostitutes on the street. They will defile the atmosphere of social life with filthy talk and ribald jest. Even a clean and ennobling passion can do little to redeem them. The pure stream of human love is made turbid with lust. After a temporary uplifting in marriage the soul is again dragged down, marriage vows are broken, and the blessings of home life are turned into wormwood and gall.

That a system so destructive of physical and of spiritual health should have lasted almost intact until now will, I believe, shortly become a matter for general amazement; for while evidence of the widespread character of youthful perversion is a product of quite recent years, the assumptions on which this system has been based are unreasonable and incapable of proof.

Since conclusive evidence of the prevalence of impurity among boys is available, I will not at present invite the reader to examine the assumptions which lead most people to a contrary belief. When I do so, I shall hope to demonstrate that we might reasonably expect to find things precisely as they are. In the first and second chapters we shall see to what conclusions teachers who have actual experience in the matter have been led.

There are several teachers whose authority in most matters stand so very much above my own that it might seem presumptuous to begin by laying my own experiences before the reader; but I venture to take this course because no other teacher, as far as I know, has published quite such definite evidence as I have done; and I think that the more general statements of such eminent men as Canon Lyttelton, Mr. A. C. Benson, and Dr. Clement Dukes will appeal to the reader more powerfully when he has some idea of the manner in which conclusions on this subject may be reached. I have some reason, also, for the belief that the paper I read in 1908 at the London University before the International Congress on Moral Education has been considered of great significance by very competent judges. By a special decision of the Executive of the Congress it—alone of all sectional papers—was printed *in extenso* in the official report. Later on, it came under the notice of Sir R. Baden-Powell, at whose request it was republished in the *Headquarters Gazette*—the official organ of the Boy Scout movement.

It certainly did require some courage at the time to put my results before the public, for I was not then aware that men of great eminence in the educational world had already made equally sweeping, if less definite, statements. Emboldened by this fact and by the commendations above referred to, I venture to quote the greater part of this short paper.

"The opinions I am about to put forward are based almost entirely on my own twenty years' experience as a housemaster. My house contains forty-eight boys, who vary in age from ten to nineteen, and come from comfortable middle-class homes.

"Private interviews with individual boys in my study have been the chief vehicle of my teaching and the chief source of my information. My objects in these interviews have been to warn boys against the evils of private impurity, to supply them with a certain amount of knowledge on sexual subjects in order to prevent a prurient curiosity, and to induce them to confide to me the history of their own knowledge and difficulties. In my early days I interviewed those only who appeared to me to be obviously suffering from the effects of impurity, and, of late years, the extreme pressure of my work has forced me very reluctantly to recur to this plan.

"For several years, however, I was accustomed to interview every boy under my care during his first term with me. Very rarely have I failed in these interviews so to secure a boy's confidence as to learn the salient facts of the history of his inner life. Sunday afternoon addresses to the Sixth Form on the sexual dangers of late youth and early manhood have resulted at times in elder boys themselves seeking an interview with me. Such spontaneous confidences have naturally been fuller, and therefore more instructive, than the confidences I have invited.

"Many people are inclined to look upon the instruction of boys in relation to adolescence as needless and harmful; needless because few boys, they imagine, awake to the consciousness and problems of sex until manhood; harmful because the pristine innocence of the mind is, they think, destroyed, and evils are suggested of which a boy might otherwise remain unconscious. To one who knows what boys really are such ideas are nothing less than ludicrous.

"Boys come to our school from many different classes of preparatory and secondary schools. Almost every such school seems to possess a few boys who delight to initiate younger boys into sexual knowledge, and usually into knowledge of solitary vice. The very few boys who have come to me quite ignorant of these matters have come either straight from home at ten or eleven, or from a school in which a few young boys are educated with girls. Of boys who have come under my care as late as twelve I have known but two who even professed total ignorance on sexual subjects, and in one of these cases I am quite sure that no such ignorance existed.

"In a large majority of cases solitary vice has been learned and practised before a boy has got into his teens. The lack of insight parents display in relation to these questions is quite phenomenal. The few who mention the subject to me are always quite satisfied of the complete 'innocence' of their boys. Some of the most precocious and unclean boys I have known have been thus confidently commended to me. Boys are wholly unsuspicious of the extent to which their inner life lies open to the practised eye, and they feel secure that nothing can betray their secrets if they themselves do not.

"In no department of our life are George Eliot's words truer than in this department: 'Our daily familiar life is but a hiding of ourselves from each other behind a screen of trivial words and deeds, and those who sit with us at the same hearth are often the farthest off from the deep human soul within us—full of unspoken evil and unacted good.' We cannot prevent a boy's obtaining information on sexual questions. Our choice lies between leaving him to pick it up from unclean and vulgar minds, which will make it guilty and impure, and giving it ourselves in such a way as to invest it from the first with a sacred character.

"Another idea which my experience proves to be an entire delusion is the idea that a boy's natural refinement is a sufficient protection against defilement. Some of the most refined boys I have had the pleasure of caring for have been pronounced victims of solitary sin. That it is a sin at all, that it has, indeed, any significance, either ethical or spiritual, has not so much as occurred to most of them. On what great moral question dare we leave the young to find their own way absolutely without guidance? In this most difficult and dangerous of all questions we leave the young soul, stirred by novel and blind impulses, to grope in the darkness. Is it any wonder if it fails to see things in their true relations?

"Again, it is sometimes thought that the consequences of secret sin are so patent as to deter a boy from the sin itself. So far is this from being the case that I have never yet found a single boy (even among those who have, through it, made almost complete wrecks physically and mentally) who has of himself connected these consequences with the sin itself. I have, on the other hand, known many sad cases in which, through the weakening of will power, which this habit causes, boys of high ideals have fallen again and again after their eyes have been fully opened. This sin is rarely a conscious moral transgression. The boy is a victim to be sympathised with and helped, not an offender to be reproved and punished."

I desire to call the attention of the reader to two points in the foregoing extract. I was particular in giving my credentials to state the character and limitations of my experience. Everywhere in life one finds confident and sweeping generalisations made by men who have little or no experience to appeal to. This is specially the case in the educational world, and perhaps most of all in discussions on this very subject. Some men, at least, are willing to instruct the public with nothing better to guide them than the light of Nature. It would greatly assist the quest of truth if every one who ventures to address the public on this question would first present his credentials.

There is danger lest the reader should discount the significance of the statements I make in the foregoing paper by falling into the error of supposing that the facts stated apply, after all, to one school only. This is not by any means so. The facts have been collected *at* one school; but those which refer to the prevalence of sex knowledge and of masturbation have reference solely to the condition of boys when they first entered, and are significant of the conditions which obtain at some scores of schools and in many homes. I venture here to quote and to warmly endorse Canon Lyttelton's opinion: "It is, however, so easy to be misunderstood in this matter that I must insert a caution against an inference which may be drawn from these words, viz. that school life is the *origin* of immorality among boys. The real origin is to be found in the common predisposition to vicious conceptions, which is the result of neglect. Nature provides in almost every case an active curiosity on this subject; and that curiosity must be somehow allayed; and if it were not allayed at school, false and depraved ideas would be picked up at home. . . . So readily does an ignorant mind at an early age take in teaching about these subjects that there are no conceivable conditions of modern social life not fraught with grave peril to a young boy, if once he has been allowed to face them quite unprepared, either by instruction or by warning. And this manifestly applies to life at home, or in a day-school, or in a boarding-school to an almost equal degree."[1]

One of the facts which I always tried to elicit from boys was the source of their information—or rather the character of that source, for I was naturally anxious not to ask a boy to incriminate any individual known to me. In many cases, information came first to the boy at *home* from a brother, or cousin, or casual acquaintance, or domestic servant. In one of the worst cases I have known the information was given to a boy by another boy—an entire stranger to him—whom he happened to meet on a country road when cycling. Since boys meet one another very much more at school than elsewhere and spend three-fourths of their lives there, of course information is more often obtained at school than at home. My own experience leads me to think that in this respect the day-school—probably on account of its mixed social conditions—is worse than the boarding-school.

Since 1908 I have again found time to deal with every boy in my house at some period of his stay with me. I have not kept, as I did formerly, written notes of each case; but further experience has merely confirmed in every respect the opinions above quoted.

Before passing from matters of personal experience, it may interest the reader if I give particulars of a few typical cases to illustrate some points on which I have insisted.

Case A.—The father and mother of a boy close on thirteen came to see me before entering the lad. They had no idea that I was specially interested in purity-teaching; but they were anxious to ascertain what precautions we took against the corruption of small boys. They struck me as very good parents. I was specially pleased that they were alive to the dangers of impurity and that the mother could advert openly to the matter without embarrassment. I advised them to give the boy explicit warning; but they said that they were anxious to preserve his innocence as long as possible. He was at present absolutely simple, and they hoped that he would long remain so. It was a comfort to them that I was interested in the subject, and they would leave the boy with confidence in my care. As soon as I saw the boy, I found it difficult to believe in his innocence; and I soon discovered that he was thoroughly corrupt. Not merely did he begin almost at once to corrupt other boys; but he actually gave them his views on brothels. In a private interview with me he admitted all this, and told me that he was corrupted at ten years of age, when he was sent, after convalescence from scarlet fever, to a country village for three months. There he seems to have associated with a group of street boys, who gave him such information as they had, and initiated him into self-abuse. Since then he had been greedily seeking further information and passing it on.

Case B.—A delicate, gentle boy of eleven, an only son, was sent to me by an intellectual father, who had been his constant companion. The lad was very amiable and well-intentioned. A year later he gave me particulars of his corruption by

[1] *Training of the Young in Relation to Sex*, p. 7 *et seq.*

a cousin, who was three years older than he. Since that time—particularly of late—he had practised masturbation. He had not the least idea that it was hurtful or even unrefined, and thought that it was peculiar to himself and his cousin. He knew from his cousin the chief facts of maternity and paternity, but had not spoken to other boys about them. He was intensely anxious to cleanse himself entirely, and promised to let me know of any lapse, should it occur. In the following vacation he developed pneumonia. For some days his life hung in the balance, and then flickered out. His father wrote me a letter of noble resignation. Terribly as he felt his loss, he was greatly consoled, he said, by the knowledge that his boy had died while his mind was innocent and before he could know even what temptation was. It is needless to add that I never hinted the real facts to the father; and—without altering any material detail —I am disguising the case lest it should possibly be recognised by him. I have often wondered whether, when the lad's life hung in the balance, it might not have been saved if Death's scale had not been weighted by the child's lowered vitality.

Case C.—A boy of fourteen came to me. He was a miserable specimen in every way—pale, lethargic, stupid almost beyond belief. He had no mother; and the father, though a man of leisure, evidently found it difficult to make the lad much of a companion. I felt certain from the first that the boy was an exceptionally bad victim of self-abuse; and this I told his father, advising him to investigate the matter. He was horrified at my diagnosis, and committed the great indiscretion of taxing the boy with self-abuse as though it were a conscious and grave fault. The father wrote during the vacation saying that he found I was entirely mistaken: not content with the lad's assurance, he had watched him with the utmost care. As soon as the boy returned to school I interviewed him. He admitted readily that he had long masturbated himself daily—sometimes oftener. He had first—as far as he could remember, at about six—had his private parts excited by his nurse, who apparently did this to put an irritable child into a good temper. My warning had little effect upon him, as he had become a hopeless victim. He was too delicate a boy for us to desire to keep; and after a brief stay at school, during which we nursed him through a critical illness, he left to finish his education under private tuition at home.

Case D.—This boy came to me at thirteen. He was always a conscientious and amiable boy, but was nervous and dull. By fifteen his dullness had increased, and he complained of brain-strain and poorness of memory. Finally he began to develop St. Vitus's dance. I sent him to our school doctor, who returned him with a note saying that his condition was serious, that he must stop all work, &c. &c. I was in my study when the lad came back, and I at once told him what was the matter. He frankly admitted frequent self-abuse, which he had learned from an elder brother. He had not the least suspicion that the habit was injurious; but was very apprehensive about his future until I assured him. He wanted me to write at once and warn a younger brother who had fallen into the habit. By great effort he got himself rapidly under control. His nervous twitchings disappeared, his vitality improved, the brain-fag gradually ceased; and when he left, eighteen months later, he was fairly normal. His improvement continued afterwards, and he is now a successful man of business and a married man.

Case E.—This boy entered at twelve. He was very weak physically and highly nervous—owing, his people thought, to severe bullying at a previous school. He was an able boy, of literary and artistic tastes, and almost painfully conscientious. He was very shy; always thought that he was despised by other boys; and was a duffer at games, which he avoided to the utmost. With my present experience I should have known him to be a victim of self-abuse. Then, I did not suspect him, and it was not until he was leaving at eighteen for the University that we talked the matter over, on his own initiative. Then I found that he had been bullied into impurity at eleven, and was now a helpless victim. After two years at the University he wrote me that, though the temptation now came less frequently, he seemed absolutely powerless when it did come; that he despised himself so much, that the impulse to suicide often haunted him; but that the cowardice which had kept him from games at school would probably prevent his taking his life. With the assistance of an intense and devoted religious life he gradually began to gain self-mastery. It is some years now since he has mentioned the subject to me.

These are merely specimen cases. Cases A, B, and C illustrate my assertions that parents are wonderfully blind: Cases B and E that quite exceptional refinement in a boy gives no protection from temptation to impurity: Case D that a boy, even in an extreme case, does not know that the habit is injurious. In respect of their severity C, D, and E are not normal but extreme cases. The reader must not imagine that boys ordinarily suffer as much as these did.

PREVALENCE OF IMPURITY AMONG BOYS: THE OPINIONS OF CANON LYTTELTON, DR. DUKES, AND OTHERS

I propose now to make clear to the reader the fact that the conclusions I have reached as to the existence of sexual knowledge among boys, and as to the prevalence of self-abuse, are entirely borne out by the opinions of the most distinguished teachers and medical men.

Canon Lyttelton writes with an authority which no one will question. Educated at Eton, he was for two years an assistant master at Wellington College; then, for fifteen years, headmaster of Haileybury College, and has now been headmaster of Eton for over six years. He has intimate knowledge of boys, derived, as regards the question of purity, from confidential talks with them. The quotations which follow are from his work *The Training of the Young in Laws of Sex,* to which I have referred in the preface. Canon Lyttelton does not think it needful to make statements as to the prevalence of impurity among boys. He rather assumes that this prevalence is obvious and, under present conditions, inevitable. I have already quoted one passage which involves this assumption, and now invite the reader to consider two others. "In the school life of boys, in spite of very great improvements, it is *impossible* that sexual subjects should be wholly avoided in common talk. . . . Though, in preparatory schools of little boys under fourteen, the increasing vigilance of masters, and constant supervision, combined with constant employment, reduce the evil of prurient talk to a minimum, yet these subjects *will* crop up. . . . It should be remembered that the boys who are talkative about such subjects are just those whose ideas are most distorted and vicious. In the public school, owing not only to freer talk and more mixed company but to the boy's own wider range of vision, sexual questions, and also those connected with the structure of the body, come to the fore and begin to occupy more or less of the thoughts of all but a peculiarly constituted minority of the whole number.

"Men, as I have shown, have been severely dealt with by Nature in this respect; she has forced them, at a time of life when their minds are ill compacted, their ideas chaotic, and their wills untrained, to face an ordeal which demands above all things reverence based on knowledge and resolution sustained by high affections. An *enormously large proportion* flounder blindly into the mire before they know what it is, not necessarily, but very often into the defilement of evil habit, but, still more often, into the tainted air of diseased opinion, and after a few years *some of them* emerge saved, but so as by fire."[1]

The following are quotations from the *Upton Letters*, written by Mr. A. C. Benson. Mr. Benson is one of the most distinguished of modern teachers: he has had long experience of public-school life both as a boy and as a master: he has that insight into the heart of boyhood which can come only to one who has affectionate sympathy with boys and has been the recipient of their confidences. It will be abundantly evident from the passages which follow that in Mr. Benson's opinion no boy is likely to preserve his "innocence" in passing through a public school.

"The subject is so unpleasant that many masters dare not speak of it at all, and excuse themselves by saying that they don't want to put ideas into boys' heads. I cannot conscientiously believe that a man who has been through a big public school himself can honestly be afraid of that." "The standard of purity is low: a vicious boy does not find his vicious tendencies by any means a bar to social success." This, of course, assumes that the vicious tendencies are a matter of notoriety. A similar implication is involved in the following: "I do not mean to say that there are not many boys who are both pure-minded and honest: but they treat such virtues as a secret preference of their own, and do not consider that it is in the least necessary to interfere with the practice of others or even to disapprove of it." He further gives it as his opinion that "The deadly and insidious temptation of impurity has, as far as one can learn, increased," and tells us "An innocent-minded boy whose natural inclination to purity gave way before perpetual temptation and even compulsion might be thought to have erred, but would have scanty, if any, expression of either sympathy or pity from other boys; while if he breathed the least hint of his miserable position to a master and the fact came out, he would be universally scouted. . . . One hears of simply heart-rending cases where a boy dare not even tell his parents of what he endures." It would thus appear that in some of the premier schools of the world impurity is a matter of notoriety, sometimes of compulsion; and that, to a boy's own strong inclination to concealment, is superadded, by the public opinion of the school, an imperious command that this concealment shall, even in heart-rending cases, be maintained.

No one, I think, will maintain that private schools *as a class* are in the least degree less corrupt than public schools. While there are, I am sure, at least a few schools in which public opinion condemns *open* impurity and will not tolerate impure talk; and while I am confident that it is possible, not merely to attain this condition in a school, but also to reduce private impurity to a negligible quantity, impurity—in one form or another—is, in general, so widely spread in boys' schools of every type, that it is difficult to understand how anyone familiar with school life can doubt its prevalence.

Let us now consider the opinion of Dr. Clement Dukes, the medical officer of Rugby School and the greatest English authority on school hygiene. In the preface to the fourth edition of his well-known work, *Health at School*, Dr. Dukes writes: "I have studied children in all their phases and stages for many years—two years at the Hospital for Sick Children in 61 Ormond Street, London, followed by thirty-three years at Rugby School—a professional history which has provided me with an almost unique experience in all that relates to the Health and Disease of Childhood and Youth, and has compelled constant and steady thought upon every aspect of this problem." In an earlier work, *The Preservation of Health*, Dr. Dukes gives his estimate of the prevalence of masturbation, and quotes the opinion of other authorities whose credentials he has verified. In this work, on page 150, he writes of masturbation: "I believe that the reason why it is so widespread an evil—amounting, I gather, although from the nature of the case no complete evidence can ever be accurately obtained, to somewhere *about* 90 *to* 95 *per cent. of all boys at boarding-schools*—is because the boy leaves his home in the first instance without one word of warning from his parents . . . and thus falls into evil ways from his innocence and ignorance alone. . . . This immorality is estimated by some at 80 per cent., by others at 90 per cent. Another says that not 10 per cent. are innocent. Another that it has always begun at from eight to twelve years of age. Others that it is always worst amongst the elder boys. Others that 'it is universal.'" And yet there are people who deprecate purity-teaching for boys because they feel that a boy's natural modesty is quite a sufficient protection, and that there is danger of destroying a boy's innocence by putting ideas into his head. To hear such people talk, and to listen to the way in which they speak of self-abuse as though it implied monstrous moral perversion, one would think that the condition of morals when they were young was wholly different. The great novelist Thackeray gives little countenance to this opinion when he writes in *Pendennis*: "And, by the way, ye tender mothers and sober

[1] Page 4 *et seq.*: the italics are mine.

fathers of Christian families, a prodigious thing that theory of life is as orally learned at a great public school. Why if you could hear those boys of fourteen who blush before mothers and sneak off in silence in the presence of their daughters, talking among each other—it would be the woman's turn to blush then. Before he was twelve years old little Pen had heard talk enough to make him quite awfully wise upon certain points—and so, madam, has your pretty rosy-cheeked son, who is coming home from school for the ensuing holidays. I don't say that the boy is lost, or that the innocence has left him which he had from 'Heaven, which is our home,' but that the shades of the prison-house are closing fast over him, and that we are helping as much as possible to corrupt him."

Before concluding this chapter I would caution the reader against the error of supposing that the opinions expressed by Canon Lyttelton and Dr. Dukes are indicative merely of the conditions they have met at Haileybury, Eton, and Rugby. They are equally significant of the conditions which obtain in the innumerable schools from which Haileybury, Eton, and Rugby are recruited, and, as ther is no reason why other preparatory schools should differ from these, they are significant of the almost universal condition of boys' schools.

CAUSES OF THE PREVALENCE OF IMPURITY AMONG BOYS

The evidence I have adduced in the previous chapters will convince most of my readers that few boys retain their innocence after they are of school age. There may, however, be a few who find it impossible to reconcile this conclusion with their ideas of boy nature. I will therefore now examine current conceptions on this subject and expose their fundamental inaccuracy.

There are some people who imagine that a boy's innate modesty is quite sufficient protection against defilement. Does experience really warrant any such conclusion? Those who know much of children will recognise the fact that even the cardinal virtues of truthfulness and honesty have often to be learned, and that ideals of personal cleanliness, of self-restraint in relation to food, and of consideration for others have usually to be implanted and fostered. Among people of refinement these virtues are often so early learned that there is danger lest we should consider them innate. The susceptibility of some children to suggestions conveyed to them by the example and precept of their elders is almost unlimited. Hence a child may, at two, have given up the trick of clearing its nostrils with the finger-nail, and may, before five, have learned most of the manners and virtues of refined people. The majority, however, take longer to learn these things, so that a jolly little chap of ten or twelve is often by no means scrupulously clean in hands, nails, ears, and teeth, is often distinctly greedy, and sometimes far from truthful.

That cleanliness and virtue are acquired and not innate is obvious enough from the fact that children who grow up among dirty and unprincipled people are rarely clean and virtuous. Were it possible for the child of refined parents to grow up without example or precept in relation to table manners and morals, except the example and advice of vulgar people, who would expect refinement and consideration from him? Is there anyone who has such faith in innate refinement that he would be content to let a child of his own grow up without a hint on these matters, and with such example only as was supplied by association with vulgar people? Yet this is precisely what we do in relation to the subject of personal purity. The child has no good example to guide him. The extent to which temptation comes to those whom he respects, the manner in which they comport themselves when tempted, the character of their sex relations are entirely hidden from him. He is not only without example, he is without precept. No ideals are set before him, no advice is given to him: the very existence of anything in which ideals and advice are needful is ignored.

If, in conditions like these, we should expect a boy to grow up greedy, we may be certain that he will grow up impure. At puberty there awakes within him by far the strongest appetite that human nature can experience—an appetite against which some of the noblest of mankind have striven in vain. The appetite is given abnormal strength by the artificial and stimulating conditions under which he lives. The act which satisfies this appetite is also one of keen pleasure. He has long been accustomed to caress his private parts, and the pleasure with which he does this is enormously enhanced. He does not suspect that indulgence is harmful. This pleasure, unlike that of eating, costs him nothing, and is ever available. His powers of self-control are as yet undeveloped. He can indulge himself without incurring the least suspicion. He probably knows that most boys, of his age and above, indulge themselves. The result is inevitable. He finds that sexual thoughts are keenly pleasurable, and that they produce bodily exaltation. He has much yet to learn on the subject of sex, and he enjoys the quest. Wherever he turns he finds it now—in his Bible, in animal life, in his classics, in the encyclopædia, in his companions, and in the newspaper. Day and night the subject is ever with him. It is inevitable. And at this juncture comes along the theorist who is aghast at our destroying the lad's "innocence," and at our "suggesting evils to him which otherwise he would never have thought of." "The boy's innate modesty is quite a sufficient protection"!

To me the wonderful thing is the earnestness with which a boy sets about the task of cleansing his life when once he has been made to realise the real character of the thoughts and acts with which he has been playing. Boys, as I find them, rarely err in this matter, or in any other, from moral perversity, but merely from ignorance and thoughtlessness. Severe rebukes and punishments are rarely either just or useful. The disposition which obliges the teacher to use them in the last resort, and the rebellion against authority which is said to follow puberty, arise almost invariably from injudicious training in the home or at school. Boys who have received a fair home training, and who find themselves in a healthy atmosphere at school, are almost invariably delightful to deal with; and, even those who have been less fortunate in their early surroundings, adapt themselves in most cases to the standards which a healthy public opinion in the school demands.

It may be thought that the mere reticence of adults about reproduction and the reproductive organs would impress the child's mind with the idea that it is unclean to play with his private parts or to talk about their functions with his companions. This is a psychological error. For some years past adults have avoided any allusion to the subject of excretion, and the child assumes that *public* attention to bodily needs and *public* reference to these needs are alike indelicate. He does not, however, conclude that excretion in private is an indelicate act, nor does any sense of delicacy oblige him to maintain, with regard to companions of his own sex and age, the reticence which has become habitual to him in his relations with adults. Why should the child think it "dirty" to play with his private parts or to talk about them with his boy friends. The knowledge which makes us feel as we do is as yet hidden from him.

The same thing is certainly true of conversation about the facts of reproduction when those who converse are uncorrupted. Another element, however, at once appears when these facts are divulged by a corrupt boy, because his manner is irresistibly suggestive of uncleanness as well as of secrecy. Similarly when self-abuse is fallen into spontaneously by a boy who is otherwise clean, no sense of indecency attaches itself to the act. When, however, it is taught by an unclean boy, there is a feeling of defilement from the first. In boys under the age of puberty this feeling may overpower the temptation: in boys above that age it is, as a rule, totally inadequate as a safeguard.

Many people imagine that a boy who is impure must betray himself, and that if no overt acts of indecency are observed the innocence of a boy's mind may be safely inferred. Knowledge on these subjects has, however, been almost invariably gained under conditions of the utmost secrecy, and the behaviour of adults has effectively fostered the idea of concealment. Hence we might expect that the secret would be jealously guarded and that any overt act of impurity would be avoided in the presence of adults with even greater circumspection than the public performance of an excretory act. The habit of self-abuse, moreover, is practised usually under the double cover of darkness and the bed-clothes. The temptation occurs far less by day than by night, and a boy who yields to it in the day invariably chooses a closet or other private place in which he feels secure from detection.

To many people it is inconceivable that a lad can harbour impure feelings and habits without obvious deterioration, but, even if a child's lapses into these things were associated with conscious guilt, does our knowledge of human nature justify us in supposing that evil in the heart is certain to betray itself in a visible degradation of the outer life? If we believe the language of the devout, we must admit that the most spiritual of men hide in their hearts thoughts of which they are heartily ashamed. It is not into the mouth of the reprobate but into the mouth of her devoted members as they enter upon their sacramental service that the Church puts the significant prayer, "Almighty God, unto whom all hearts be open, all desires known, and from whom no secrets are hid; Cleanse the thoughts of our hearts by the inspiration of thy Holy Spirit."

Inconsistency in adults is far too well recognised to need proof. In children it is even more obvious, and for this reason, that, looked at aright, it is the faculty of maintaining the general health of the soul, spite of local morbid conditions—a faculty which is strongest in the simpler and more adaptable mind of the child.

Impurity as a disease has a long incubation period. When he contracts the disease, its victim is often wholly unconscious of his danger; and, both because the disease is an internal one and is slow in development, it is a very long time before obvious symptoms appear. Meanwhile a corruption may have set in which will ultimately ruin the whole life.

RESULTS OF YOUTHFUL IMPURITY

It is difficult to exaggerate the evils which result from the present system under which boys grow to manhood without any adult guidance in relation to the laws of sex.

It has already been stated that the immediate physical results of self-abuse are small evils indeed compared with the corruption of mind which comes from perverted sex ideas. They are, however, by no means negligible; and are, in some cases, very serious. The great prevalence of self-abuse among boys, combined with the inevitable uncertainty as to the degree of a boy's freedom from, or indulgence in, this vice, makes it very difficult to institute a reliable comparison between those who are chaste and those who are unchaste. Greater significance attaches, I think, to a comparison in individual cases of a boy's condition during a period of indulgence in masturbation and his condition after its total, or almost total, relinquishment. I have no hesitation in saying that the difference in a boy's vitality and spiritual tone after relinquishing this habit is very marked. The case *D* quoted above is, in this respect, typical.

In my pamphlet, *Private Knowledge for Boys*, I have quoted a striking passage from Acton on the Reproductive Organs, in which he contrasts the continent and the incontinent boy. But in the case of men like Dr. Acton—specialists in the diseases of the male reproductive organs—it must be remembered that it is mostly the abnormal and extreme cases which come under their notice: a fact which is liable to affect their whole estimate. The book can be recommended to adults who wish to see the whole subject of sex diseases dealt with by a specialist who writes with a high moral purpose.

My own estimate is given in the pamphlet already referred to. After quoting Dr. Acton's opinion, I add:

"You will notice that Dr. Acton is here describing an extreme case. I want to tell you what are the results in a case which is not extreme. My difficulty is that these results are so various. The injury to the nerves and brain which is caused by sexual excitement and by the loss of semen leaves nothing in the body, mind, or character uninjured. The *extent* of the injury varies greatly with the strength of a boy's constitution and with the frequency of his sin. The *character* of the injury varies with the boy's own special weaknesses and tendencies. If he is naturally shy and timid, it makes him shyer and more timid. If he is stupid and lazy, it makes him more stupid and lazy. If he is inclined to consumption or other disease, it destroys his power of resisting such disease. In extreme cases only does it actually change an able boy into a stupid one, an athletic boy into a weak one, and a happy boy into a discontented one; but in all cases it *weakens* every power a boy possesses. Its most prominent results are these: loss of will-power and self-reliance, shyness, nervousness and irritability, failure of the reasoning powers and memory, laziness of body and mind, a diseased fondness for girls, deceitfulness. Of these results, the loss of will-power leaves the boy a prey not only to the temptations of impurity, but to every other form of temptation: the deceitfulness destroys his self-respect and turns his life into a sham."

Of incomparably greater importance than Acton's wide but abnormal experience and my own narrow but normal experience is the experience of Dr. Clement Dukes, which is very wide and perfectly normal. No man has probably been in so good a position for forming an estimate as he has been. Dr. Dukes thus sums up his opinion: "The harm which results is moral, intellectual, and physical. *Physically* it is a frequent drain at a critical time of life when nature is providing for growth and development, and is ill able to bear it; it is a powerful nervous shock to the system ill-prepared to meet it. . . . It also causes muscular and mental debility, loss of spirit and manliness, and occasional insanity, suicide and homicide. Moreover it leads to further uncontrollable passions in early manhood. . . . Further, this vice enfeebles the *intellectual* powers, inducing lethargy and obtuseness, and incapacity for hard mental work. And last, and most of all, it is an *immorality* which stains the whole character and undermines the life."

In this passage Dr. Dukes refers to the intellectual and moral harm of self-abuse as well as to its physical consequences. Intimately connected as these are with one another, I am here attempting to give them separate treatment. It is, however, impossible to treat perverted sex-knowledge and self-abuse separately; for though in young boys they are found independently of one another, and sometimes co-exist in elder boys without any intimate conscious association, their results are identical. In the following pages, therefore, I shall refer to them jointly as impurity.

The earliest evil which springs from impurity is the destruction of the intimacy which has hitherto existed between the boy and his parents. Closely associated with this is that duplicity of life which results from secrets which may be shared with the coarse but must be jealously concealed from everyone who is respected. Untold harm follows these changes in a lad. Hitherto he has nothing to conceal from his mother—unless, indeed, his parents have been foolish enough to drive him into deception by undue severity over childish mistakes, and accidents, and moral lapses. Every matter which has occupied his thoughts he has freely shared with those who can best lead him into the path of moral health. Henceforth, all is changed. The lad has his own inner life, which he must completely screen from the kind eyes which have hitherto been his spiritual lights. Concealment is soon found to be an easy thing. Acts and words are things of which others may take cognisance. The inner life no one can ever know. A world is opened to the lad in which the restraints of adult opinion are not felt at all and the guidance and inspiration of a father's or mother's love never come. How completely this is the case in regard to impurity the reader will hardly doubt if he remembers that all parents believe their boys to be innocent, and that some 90 per cent. of them are hopelessly hoodwinked. But this double life is not long confined to the subject of purity. The concealment which serves one purpose excellently can be made to serve another; and henceforth parents and adult friends need never know anything but what they are told. It is a sad day for the mother when first she realises that the old frankness has gone; it is a very, very much sadder day for the boy. There is no fibre of his moral being but is, or will be, injured by this divorce of home influences and by this ever-accumulating burden of guilty memories. "His mother may not know why this is so," writes Canon Lyttelton; "The only thing she may be perfectly certain of is that the loss will never be quite made up as long as life shall last."

Another injury done by impurity to the growing mind of the lad is that, in all matters relating to sex, he learns to look merely for personal enjoyment. In every other department of life he is moved by a variety of motives: by the desire to please, the desire to excel, by devotion to duty, by the love of truth, and by many other desires. Even in gratifying the appetite most nearly on the same plane as the sexual appetite—namely, that of hunger—he has more or less regard for his own well-being, more or less consideration for the wishes of others, and a constant desire to attain the standard expected of him. Meanwhile, as regards the sexual appetite—the racial importance of which is great; and the regulation of which is of infinite importance for himself, for those who may otherwise become its victims, for the wife he may one day wed, and for the children, legitimate or illegitimate, that he may beget—his one idea is personal enjoyment.

When boyish impurity involves a coarse way of looking at sexual relations, as it always must when these are matters of common talk and jest, the boy suffers a loss which prejudicially affects the whole tone of his mind and every department of his conduct—I mean the loss of reverence. It is those things alone which are sacred to us, those things about which we can talk only with friends, and about which we can jest with no one, that have inspiration in them, that can give us power to follow our ideals and to lay a restraining hand on the brute within us. Fortunately the self-control which manifests itself in heroism, in good form, and in the sportsmanlike spirit is sacred to almost all. To most, a mother's love is sacred. To many, all that is implied in the word religion. To a few, sexual passion and the great manifestations of human genius in poetry, music, painting, sculpture and architecture. Exactly in proportion as these things are profaned by jest and mockery, is the light of the soul quenched and man degraded to the level of the beast. Considering how large a part the sex-passion plays in the lives of most men and women; considering how it permeates the literature and art of the world and is—as the basis of the home—the most potent factor in social life, its profanation is a terrible loss, and the habit of mind which such profanation engenders cannot fail to weaken the whole spirit of reverence. I must confess that the man who jests over sex relations is to me incomparably lower than the man who sustains clean but wholly illegitimate sex relations; and while I am conscious of a strong movement of friendship towards a lad who has admitted impurity in his life but retains reverence for purity, it is hard to feel anything but repulsion towards one who profanes the subject of sex with coarse and ribald talk.

As a result of the two evils of which I have now spoken, together with the physical effects of masturbation, young men become powerless to face the sexual temptations of manhood; and many, who in all other relations of life are admirable, sink in this matter into the mire of prostitution or the less demoralising, but far crueller, sin of seduction.

Thrown on the streets, usually through no fault of her own, often merely from an over-trustful love, the prostitute sinks to the lowest depths of degradation and despair. It is not merely that she sells to every comer, clean or bestial, without even the excuse of appetite or of passion, what should be yielded alone to love; but it is also that to do this she poisons body and mind with spirit-drinking, leads a life of demoralising indolence and self-indulgence, is cut off from all decent associations, and sinks, under the combined influence of these things and of fell disease, into a loathsome creature whom not the lowest wants; sinks into destitution, misery, suicide, or the outcast's early grave. Writing of the young man who is familiar with London, the Headmaster of Eton says, "He cannot fail to see around him a whole world of ruined life: a ghastly varnish of gaiety spread over immeasurable tracts of death and corruption; a state of things so heart-rending and so hopeless that on calm consideration of it the brain reels, and sober-minded people who, from motive of pity, have looked the hideous evil in the face, have asserted that nothing in their experience has seemed to threaten them so nearly with a loss of reason."

Into the contamination of this inferno, into active support of this cruel infamy, many and many a young man is led by the impurity of his boyhood. Such at least is the conclusion of some who know boys best. Thus Dr. Dukes writes:

"This evil, of which I have spoken so long and so freely, is, I believe, *the root of the evil of prostitution* and similar vices; and if this latter evil is to be mitigated, it can only be, to my mind, by making the life of the school-boy purer.

"How is it possible to put a stop to this terrible social evil? How is it possible to *elevate women* while the demand for them for base purposes is so great? We must go to the other end of the scale and make men better; we must train young boys more in purity of life and chastity BEFORE their passions become uncontrollable.

"Whereas, the cry of every moralist and philanthropist is, 'Let us put a stop to this prostitution, open and clandestine.' This cannot be effected at present, much as it is to be desired; the demand for it is too great, even possibly greater than the supply. If we wish to eradicate it, we must go to the fountain-head and make those who create the demand purer, so that the demand falling off, the supply will be curtailed."[1]

To this I venture to add that by teaching chastity we not merely decrease the demand for prostitutes, but we greatly diminish the supply. Few girls, if any, take to the streets until they have been seduced; and the antecedents of seduction are the morbid exaggeration of the sexual appetite, the lack of self-control, and the selfish hedonism which youthful impurity engenders.

The selfishness, and consequent blindness to cruelty, of which I write, manifests itself quite early. A boy of chivalrous feeling, whose blood would boil at any other form of outrage on a girl, will read a newspaper account of rape or indecent assault with a pleasure so intense that indignation and disgust are quite crowded out of his mind.

If, repelled by the coarseness of the streets, the young man allows lust or passion to lead him into seduction, he commits a crime the consequences of which are usually cruel in the extreme; for in most cases the seduced girl sinks of necessity into prostitution. So blind, so callous does impurity make even the refined and generous, that many a young man who can be a good son, a good brother, a noble friend, a patriotic citizen, will doom a girl whose only fault is that she is physically attractive —and positively too affectionate and trusting—to torturing anxiety, to illness, to the horrible suffering of undesired travail, to disgrace, and in nineteen cases out of twenty to ostracism and the infamy of the streets. Murder is a small thing compared with this. Who would not rather that his daughter were killed in her innocence than that she should be doomed to such a fate?

One cannot help feeling at times that the blessings of home—and of the monogamy which makes home possible—are terribly discounted by a condition of things which offers a young man no other alternatives to chastity than these terrible evils. Now that year by year the rising standard of living and the increased exactions which the State makes on the industrious and provident cause marriage to be a luxury too expensive for many, and delayed unduly for most, the problem of social purity becomes even greater and more urgent. The instruction of the young in relation to sex provides the only solution; and is, I venture to think, incomparably the most important social reform now needed. On the young man of to-day we lay a burden which no ordinary man was ever yet able to bear. His boyhood and youth become, through ignorance, the prey of lust; his passions become tyrannous; his will is enslaved. Even if he contracts marriage, his troubles are not at an end, for man *as an animal*, is neither monogamous nor wholly constant. His neglected sex-education makes him far more susceptible to physical attractions than to those qualities which make a wife a good companion, a good housekeeper, and a good mother; and but too often, as a result, the beneficent influence of marriage is transient; the domestic atmosphere ceases to be congenial; both husband and wife become susceptible to other attachments, and the old struggle begins all over again.

[1] *The Preservation of Health*, p. 161.

SEX-KNOWLEDGE IS COMPATIBLE WITH PERFECT REFINEMENT AND INNOCENCE

The reader who has followed me through the preceding pages will, I hope, feel that, whatever objections there may be to giving explicit instruction on sex matters to the young, such instruction is immensely to be preferred to the almost inevitable perversion which follows ignorance. If we had to choose between a state of "innocence" and a state of reverent knowledge, many people would doubtless incline to the former. No such option exists. Our choice lies between leaving a lad to pick up information from vulgar and unclean minds, and giving it ourselves in such a manner as to invest it from the first with sacredness and dignity.

Even if the reader is still inclined to think that sex-knowledge is, at best, an unholy secret, he will hardly doubt that it can be divulged with less injury by an adult who is earnestly anxious for the child's welfare than by coarse and irreverent lips.

I am not content to leave the reader in this dilemma. I am confident that the following words of Canon Lyttelton spring from the truest spiritual insight: "To a lover of nature no less than to a convinced Christian the subject ought to wear an aspect not only negatively innocent, but positively beautiful. It is a recurrent miracle, and yet the very type and embodiment of law; and it may be confidently affirmed that, in spite of the blundering of many generations, there is nothing in a normally-constituted child's mind which refuses to take in the subject from this point of view, provided that the right presentation of it is the first."

Nothing more forcibly convicts the present system of the evil which lies at its door than the current beliefs on this subject. At present, sexual knowledge is picked up from the gutter and the cesspool; and no purification can free it entirely in many minds from its original uncleanness.

> "Love's a virtue for heroes!—as white as the snow on high hills,
> And immortal as every great soul is that struggles, endures and fulfils."

This is the prophet's belief, and yet, putting on one side those who actually delight in uncleanness, there appear to be many people who look upon sexual union as a form of animal indulgence to which we are so strongly impelled that even the most refined are tempted by it into an act of conscious indelicacy and sin. Such people read literally the psalmist's words: "Behold I was shapen in iniquity and in sin did my mother conceive me." It is surely some such feeling as this which makes parents shrink from referring to the subject, which underlies the constant use of the word "innocence" as the aptest description of a state of mind which precedes the acquisition of sexual knowledge.

That individuals, at least, have risen to a loftier conception than this is certain; and the only possible explanations of the prevalence of the current idea are that sex-knowledge has almost always been obtained from a tainted source; and that, while the coarse have not merely whispered their views in the ear in the closet, but have, in all ages, proclaimed them from the housetops, the refined have hardly whispered their ideas, much less discussed them publicly. Children growing up with perverted views have listened to the loud assertions of disputants on the one side, have witnessed the demoralisation which so often attends the sexual passion, but have received no hint of what may be said on the other side of the question.

An instructed public opinion would be horrified at our sovereign's taking shares in a slave-trading expedition as Queen Elizabeth did. We are aghast at the days when crowds went forth to enjoy the torture at the stake of those from whom they differed merely on some metaphysical point. We have even begun to be restless under man's cruel domination over the animal creation. But we have made far less advance in our conceptions on sexual matters; and we are content here with ideas which were current in Elizabethan days. But for this, no passion for conservatism, no reverence for a liturgy endeared by centuries of use, could induce us to tell every bride as she stands before God's altar that it is one of her functions to provide an outlet for her husband's passion and a safeguard against fornication.

Those who desire to assist in the uplifting of humanity cannot afford to be silent and to allow judgment to go against them by default. Courage they will need; for a charge of indecency is sure to be levelled against them by the indecent, and they may be misjudged even by the pure.

This is not the place in which so delicate a matter can be fully discussed, nor does space permit; but, if the movement towards sex instruction is not to be stultified by the very ideas which evidence the need for it, the subject cannot be wholly ignored here, and I venture to throw out a few suggestions.

Are we indeed to believe that the noblest and most spiritual of men will compromise themselves in the eyes of the woman they love best, and whose respect they most desire, by committing in her presence and making her the instrument of an indelicate act? A great poet, who remained an ardent lover and a devoted companion until his wife died in his arms—blissfully happy that she might die so—has written:

> "Let us not always say,
> 'Spite of the flesh to-day
> I strove, made head, gained ground upon the whole.'
> As the bird wings and sings,
> Let us cry 'All good things
> Are ours, nor soul helps flesh more, now, than flesh helps soul.'"

Again: are we, who believe in a Divine government of the world, able to imagine that God has made the perpetuation of the race dependent upon acts of sin or of indelicacy? Did He who graced with His presence the marriage at Cana in Galilee really countenance a ceremony which was a prelude to sin? Did He who took the children in His arms and blessed them know, as He said "for of such is the kingdom of heaven," that not one of them could have existed without indelicacy, and that they were but living proof of their fathers' lapses and their mothers' humiliation? Is He whom we address daily as "Our Father" willing to be described by a name with which impurity is of necessity connected? And has He implanted in us as the strongest of our instincts that which cannot elevate and must debase ?

Again: it needs no wide experience of life, nor any very indulgent view of it, to feel some truth at least in the words Tennyson puts into the mouth of his ideal man:

> "Indeed I knew
> Of no more subtle master under heaven
> Than is the maiden passion for a maid
> Not only to keep down *the base in man*,
> But teach high thought, and amiable words,
> And courtliness, and the desire for fame,
> And love of truth, and all that makes a man."

And yet this passion is indisputably sexual passion, and the chastest of lovers has bodily proof that the most spiritual of his kisses is allied to the supreme embrace of love.

And once again: It is the experience of those who have given instruction in sex questions to the young that by those whose minds have never been defiled the instruction is received with instant reverence, as something sacred; not with shame, as something foul. I venture once more to quote Canon Lyttelton, who sets forth his experience and my own in language the beauty of which I cannot imitate:

"There is something awe-inspiring in the innocent readiness of little children to learn the explanation of by far the greatest fact within the horizon of their minds. The way they receive it, with native reverence, truthfulness of understanding, and guileless delicacy, is nothing short of the revelation of the never-ceasing bounty of Nature, who endows successive generations of children with this instinctive ear for the deep harmonies of her laws. People sometimes speak of the indescribable beauty of children's innocence, and insist that there is nothing which calls for more constant thanksgiving than that influence on mankind. But I will venture to say that no one quite knows what it is who has foregone the privilege of being the first to set before them the true meaning of life and birth and the mystery of their own being."

To the arguments thus briefly indicated it is no answer to say that sexual union is essentially physical, and that to regard it in any other way is transcendental. Among primitive men eating and drinking were merely animal. We have made them, in our meals, an accompaniment to social pleasures, and in our religious life we have raised them to a sacramental level.

CONDITIONS UNDER WHICH PURITY TEACHING IS BEST GIVEN: REMEDIAL AND CURATIVE MEASURES

We have now seen that impurity is almost universal among boys who have been left without warning and instruction; that, under these conditions, it is practically inevitable; that its direct results are lowered vitality and serious injury to character, its indirect results an appalling amount of degradation and misery; finally, that there is nothing in sex-knowledge, when rightly presented, which can in the least defile a child's mind. All that now remains is for us to consider by whom and under what circumstances instruction on this subject should be given, and what assistance can be rendered to boys who desire to lead chaste lives

Without doubt, instruction should be given to a boy by his parents in the home. When young children ask questions with regard to reproduction, parents should neither ignore these questions nor give the usual silly answers. If the occasion on which the question is asked is not one in which an answer can appropriately be given, the child should be gently warned that the question raised is one about which people do not openly talk, and the promise of an answer hereafter should be made. Then, at the first convenient hour, the child can either be given the information he seeks or told that he shall hear all about the matter at some future specified time, as for example his sixth or eighth birthday.

In the absence of questions from a child, the ideal thing would be for the child, at the age of six, seven, or eight, to learn orally from his mother the facts of maternity and to receive warning against playing with his private parts. Whether at this time it is best to teach him the facts of paternity is, I think doubtful. Canon Lyttelton is strongly of opinion that the father's share in the child's existence should be explained when the mother's share is explained, and there is much weight in what he says. If the question of paternity is reserved, it should not be on the ground that there is anything embarrassing or indelicate about the matter, and, when the facts are revealed, the child should clearly understand that they have been withheld merely until his mind was sufficiently developed to understand them. The only safe guide in such matters is experience, and of this as yet we have unfortunately little.

The question next arises: should it be the mother or the father who gives this instruction? As regards the earlier part of the instruction a confident reply can be made to this question. The information should be given by the parent whose relations with the child are the more intimate and tender and whose influence over him is the greater. This will, of course, usually be the mother. The subject of paternity may, if reserved for future treatment, be appropriately given by the father, provided that he and his son are on really intimate terms. If timely warning is given to a child about playing with his private parts, no reference need be made to self-abuse until a boy leaves home for school, or until he is nearing the age of puberty.

There are many mothers whose insight and tact will enable them to approach these questions in the best possible way and to say exactly the right thing. There are others—a large majority, I think—who would be glad of guidance, and there are not a few who would certainly leave the matter alone unless thus guided. It was mainly to assist parents in this work that I published last year a pamphlet entitled *Private Knowledge for Boys*.[1] This embodies just what, in my opinion, should be said to an intelligent child, and it has, in my own hands, proved effective for many years past. In the case of *young* children the teaching should certainly be oral, *provided* that the mother knows clearly what to say, has sufficient powers of expression to say it well, and can talk without any feeling of embarrassment. Unless these conditions co-exist I recommend the use of a pamphlet. As

[1] To be obtained post free for six stamps from Mr. M. Whiley, Stonehouse, Glos.

I have found that children often do not know what one means by the "private parts," I make this clear at the outset.

Some into whose hands this book may come, and who have boys of twelve and upwards to whom they have never given instruction, may possibly be glad of advice as to the manner in which the subject can best be dealt with in their case. For boys of this age, I am strongly of opinion that it is better in most cases to make use of a pamphlet than to attempt oral instruction. Probably they already have some knowledge on the subject; possibly some sense of guilt. If so, it will be found very difficult to treat the matter orally without embarrassment—a thing to be avoided at all costs. I was interested to find that on receipt of my pamphlet Professor Geddes—one of the greatest experts on sex—placed it at once in the hands of his own boy, a fact from which his opinion on the relative merits of oral and printed instruction can easily be inferred.

Many of my readers who have boys of fourteen and upwards to whom they have hitherto given no instruction will, I hope, feel that they must now do this. I venture, therefore, to give a detailed account of the manner in which I should myself act in similar circumstances. I should arrange to be with the lad when there was no danger of interruption, and in such circumstances as would put him at his ease. I should tell him that I was conscious of unwisdom in not speaking to him before about a subject of supreme importance to him; that I took upon myself all blame for anything he might, in ignorance, have said or done; that through ignorance I had myself fallen and suffered, and that I should like him now to sit down and read through this pamphlet slowly and carefully. When he finished I should try by every possible means to make him sensible of my affection for him. I should associate myself in a few words with the sentiments of the writer, and should invite the lad to tell me whether he had fallen into temptation, and of so to what extent. A confidence of this kind assists a boy greatly and establishes a delightful intimacy.

There are several points with regard to purity-teaching which need to be emphasized.

Such teaching can hardly be too explicit. "Beating about the bush" is always indicative of the absence of self-possession. The embarrassment manifested is quickly perceived even by a young child, and is certain to communicate itself to the recipient. It is of paramount importance that the child should, from the first, feel that the knowledge imparted is pure; anything which suggests that it is indelicate should be studiously avoided. The introduction of a few science terms is advantageous in several ways: amongst others it relieves the tension which the spiritual aspect of the question may engender, it gives a lad a terminology which is free from filthy contamination.

It is important that the information given should be full, otherwise the boy lives in a chronic state of curiosity which, to his great detriment, he is ever trying to satisfy. If the reader feels that the information is dangerous, and aims, therefore, at imparting as little as possible, he is not fitted to do the work at all.

No greater mistake can be made than that of taxing a boy with impurity as though it were a conscious and egregious fault. I have already expressed my strong opinion that, in almost every instance, the boy is a victim to be sympathised with, not a culprit to be punished. This opinion is shared, I believe, by everyone who has investigated the subject. It is certainly the opinion of Canon Lyttelton and Dr. Dukes. It is, indeed, easy to exaggerate the conscious guilt even of boys who have initiated others into masturbation. Apart from the injustice to the boy of an attitude of severity, it is certain to shut the boy's heart up with a snap.

If a pamphlet is used it should, without fail, be taken from a boy when he has read it. Much harm may, I fear, result from supplying boys with the cheap pamphlets which well-meaning but inexperienced persons are producing.

Should the time ever come when parents give timely warning and instruction to boys, a very difficult problem will be solved for the schoolmaster. But in the meantime what ought the schoolmaster to do? The following plan commends itself to some eminent teachers. As soon as a boy is about to enter the school a letter is sent to his parents advising them to give the boy instruction, and a pamphlet is enclosed for this purpose. This plan has the decided advantage of shifting the responsibility on to the shoulders of those who ought to take it. The weakness of the plan arises from the fact that most parents do not believe in the prevalence of impurity among boys, and are quite confident that their own boys need no warning. Hence they may do nothing at all, or merely content themselves with some vague and quite useless statement.

The traditions of most boys' schools make it impossible for those intimate and respectful relations to exist between masters and boys, without which confidential teaching of this kind may be even worse than useless. Where masters are invariably referred to disrespectfully if not contemptuously; where a teacher's most earnest address is a "jaw" which the recipient is expected to betray and mock at with his companions; where to shield profanity, indecency, and bullying from detection is the imperative duty of every boy below the Sixth; where failure to avert from a moral leper the kindly treatment which might restore him to health and prevent the wholesale infection of others is the one unpardonable sin, only one or two teachers of a generation can hope to do much, and the risk of failure is immense. I can hardly believe that the present race of teachers will long tolerate the system I here advert to. Public opinion *can* be organised and enlisted as strongly on the side of Right as it is now, but too often, on the side of Evil. Mr. A. C. Benson is very moderate when he writes: "To take no steps to arrive at such an organisation, and to leave it severely alone, is a very dark responsibility."

Even in such a school, some good is, I know, done by tactful public references to the existence of masturbation and to its deplorable consequences.

The question is not free from difficulty even when the general atmosphere of the school is healthy and helpful. If one dared to leave this instruction until the age of puberty, the lad would be capable of a much deeper impression than he is at an earlier age, and the impression would be fresh just at the time at which it is most needed. In the case of boys who have come to me at nine or ten I have sometimes ventured to defer my interview for four or five years, and have found them quite uncorrupted. On the other hand, within an hour of penning these lines I have been talking to a little boy of eleven who commenced masturbation two years ago while he was under excellent home influence. One such boy may, without guilt, corrupt a whole set, for impurity is one of the most infectious as well as most terrible of diseases.

What results may we reasonably expect from adequate and timely instruction ? I have so rarely met a case in which this has been given at home that I can only infer what these results might be from the cases in which my own instruction has been given in time. In almost every instance I feel sure that the results have been beneficial, that the temptation to impurity has been little felt, and that a healthy and chaste boyhood has resulted. Canon Lyttelton writes : "The influences of school life have been found to be impotent to deprave the tone of a boy who has been fortified by the right kind of instruction from his parents." This I can well believe, for, if the schoolmaster can do much, there can be no limit to a power which has been cradled in the sanctity of home and cherished by a mother's love. This appears to be the emphatic opinion also of Dr. Dukes. Of a boy thus favoured, Canon Lyttelton writes: "He will feel that any rude handling of such a theme, even of only its outer fringe, is like the profaning of the Holy of Holies in his heart, and he will no more suffer it than he would suffer a stranger to defile the innermost shrine of his feelings by taking his mother's or his sister's name in vain. All the goading curiosity which drives other boys to pry greedily into Nature's laws, in blank ignorance of their mighty import, their unspeakable depth, and spiritual unearthly harmonies, has been for him forestalled, enlightened, and purified."

It is a sad step down from such a boy to the lad who has been given warning after corruption has begun. Most boys feel such shame in confessing to failure that one has to accept with reserve the statements made by even the most truthful of those who are treading the upward path. After making due allowance for this source of error, my experience enables me to say confidently that, if a boy has not been long or badly corrupted, a radical change of attitude may be expected in him at once, and the habit of self-abuse will be instantly or rapidly relinquished. Very different is the case of a lad who has long practised masturbation, or who has practised it for some time after the advent of puberty, or who has associated sexual imaginations with the practice. Few such boys conquer the habit at once, however much they desire to, and, if the above conditions co-exist, a boy's progress is very slow, and years may pass without anything approaching cure. If in addition to the temptations from within he has foes also without in the form of companions who sneer at his desire for improvement, controvert the statements made to him, and throw temptation in his way, his chance of cure must be enormously decreased. Of such cases I know nothing ; for my experience lies solely among boys who have, outside their own hearts, little to hinder and very much to help. As I have dealt elsewhere with the question of aids to chastity, I will make only a brief reference to it here.

The mind is so much influenced by the body that purity is impossible when the body is unduly indulged. No man exists who could inhale the vapour of chloroform without an irresistible desire to sleep. Under these conditions the strongest will would not avail even if the victim knew that by surrender he was sacrificing everything he reverenced and held dear. The lad past the age of puberty who has much stimulating food, who drinks alcohol, who sleeps in a warm and luxurious bed and occupies it for some time before or after sleep, is certain, even if he takes much exercise, to be tempted irresistibly. Dr. Dukes considers that a heavy meat meal with alcohol shortly before bedtime is in itself sufficient to ensure a lad's fall.

Meanwhile, no abstinence which is not unduly rigorous, can save a boy from impurity if he gets into the habit of exchanging glances with girls who are socially inferior, if he reads, suggestive books, looks at stimulating pictures and sights, and falls into the hopeless folly of entertaining sexual thoughts even momentarily. He who has not the strength to tread out a spark it little likely to subdue a conflagration.

The best and most timely teaching will never make carelessness in these matters justifiable, and a boy who has once been corrupted and desires to master his lower nature has no chance of self-conquest unless he gives them his constant and careful attention.

It is very important to fill a boy's leisure with congenial occupation. Idleness and dullness make a boy specially susceptible to temptation. On the other hand, the fond parent who satisfies a boy's every whim and encourages the lad to think that his own enjoyment is the chief thing in life does his utmost to destroy the lad's chance of purity —or, indeed, of any virtue whatever.

Can anything be done for boys and young men who have become the slaves of self-abuse to such an extent that they groan in the words of St. Paul: "The good that I would I do not, but the evil which I would not, that I do. . . . I delight in the law of God after the inward man, but I see another law in my members warring against the law of my mind and bringing me into captivity to the law of sin which is in my members. O wretched man that I am ! who shall deliver me from the body of this death ?" Can anything be done for the lad who has become so defiled by lustful thoughts that his utmost efforts fail to carry him forward, and even leave him to sink deeper into the mire. There are many, many such cases, alas ! for as Dr. Acton says: "The youth is a dreamer who will open the floodgates of an ocean, and then attempt to prescribe at will a limit to the inundation."

Yes, there is a remedy—I believe a specific—which can rapidly and, I think, finally restore strength to the enfeebled will and order the unclean spirit to come out of the man. It is hypnotic suggestion. Let not the reader, however, think that the matter is a simple one. In all ages any great advance in the art of healing has, by the ignorant, been attributed to the powers of darkness. The Divine Healer Himself did not escape from the charge of casting out devils by the prince of the devils, and, while hypnotic suggestion has long been used for therapeutic purposes on the Continent and is now practised in Government institutions there, the doctor or clergyman or teacher who uses it in England runs great risks; for in this subject, as in all others, it is those who are entirely without experience who are most dogmatic.

In the case of the schoolmaster, its use in this connection is practically excluded. If he applies to a parent for permission to use it he probably runs his head against a blank wall of ignorance; for hypnotism, to most people, means a dangerous power by which an unscrupulous, strong-willed Svengali dominates an abnormally weak-willed Trilby, whose will continues to grow weaker until the subject becomes a mere automaton; and most of us would rightly prefer that a boy should be his own master—even if he were rushing to headlong ruin—than that he should be the mere puppet of the most saintly man living. The human will is sacred and inviolable, and we do unwisely if we seek to control it or to remove those obstacles from its way by which alone it can gain divine strength. Meanwhile the stimulus by which the mind acquires self-mastery usually comes from without in the form of spiritual inspiration; and to remove from a boy's path an obstacle which blocks it and is entirely beyond his own strength, is equally desirable both in the physical and in the spiritual realm. Those who think that without this obstacle a boy's power of self-control is likely to receive insufficient exercise will, of course, object to the instruction advocated in this book. If it is unwise to remove this obstacle from a boy's path it is equally unwise so to instruct him as to prevent the obstacle from arising. In *trustworthy* hands hypnotic suggestion is a beneficent power which has no dangers and no drawbacks, and to decline to use it is to accept a very serious responsibility.

For the teacher a further difficulty—not to mention that of time—is that, without betraying a boy's confidence or inducing him to allow his admissions to be passed on to his father, it is impossible to give his parents an idea of the urgency of the case.

Altogether the time for hypnotic suggestion in education is not yet, but the day must come when its use is recognised not only in physical cases such as nocturnal emissions and constipation, but in all cases in which the will-power is practically in abeyance, as it is in bad cases of impurity.

For intelligent parents the difficulties are far less, and if any such care to pursue the subject farther, I would refer them to the volume on *Hypnotism* in the People's Books series or to one of the larger medical works on the subject, such as *Hypnotism and Suggestion* by Dr. Bernard Hollander.

To those who know boys well and love them much there is something intensely interesting and pathetic about the spiritual struggle through which they have to pass. The path of self-indulgence seems so obviously the path to happiness; self-denial is so hard and self-control so difficult. "The struggle of the instinct that enjoys and the more noble instinct that aspires" is ever there. The young soul reaches out after good, but its grasp is weak. It needs much enlightenment, much encouragement, much inspiration, much patient tolerance of its faults, much hopeful sympathy with its strivings, if it is ever to attain the good it seeks. In the past it has met, without light or aid, unwarned and unprepared, the deadliest foe which can assail the soul. An appetite which has in all ages debased the weak, wrestled fiercely with the strong, and vanquished at times even the noble, is let loose upon an unwarned, unarmed, defenceless child. Oh, the utter, the utter folly of it!

For life after death the writer has no longing. Immortality, if vouchsafed, appears to him to be a gift to be accepted trustfully and humbly, not to be yearned after with a sort of transcendental egoism. But to him the wish to—

> "Join the choir invisible
> Of those immortal dead who live again
> In minds made better by their presence"

grows ever stronger as the inevitable end draws nearer.

To save young lives from the needless struggles and failures of my own; to secure healthy motherhood or maiden life to some whom lust might otherwise destroy; to add, for some at least, new sanctity to human passion: these have been my hopes in penning the foregoing pages. It has been my privilege and joy, in my own quiet sphere, to preserve boys from corruption and to restore the impure to cleanness of heart. I am deeply grateful for the opportunity these pages afford of extending this delightful work. When the hand which writes these lines has long been cold in death may the message which it speeds this day breathe peace and strength into many an eager heart.

F. Arthur Sibley, M.A., LL.D.

PREGNANCY AND MOTHERHOOD

INTRODUCTION

The natural sequence to marriage is motherhood. The moment when her first child is born is often the supreme moment of a woman's life, and to the healthy-minded woman the exultation at the birth of her subsequent children is hardly less. Many young women enter on married life with the vaguest glance forward to the great miracle of maternity which yet is very imminent. The majority of married people have their first baby within a year of their marriage. It is but natural, perhaps, that the details of the conditions leading up to the birth of a child should then be faced for the first time. Yet it would be impossible to exaggerate the issues, physical and moral, which depend on the right fulfilment of the function of maternity, and the subject of the hygiene of pregnancy should be of the greatest interest to every young married woman.

Without showing a morbid preoccupation with herself and her symptoms, she should yet be intelligently on the watch for signs of the condition which is to be expected and desired. When convinced that she is with child, she should determine in the same spirit to do everything in her power to bring her child safely into the world and to give it as good a start as may be on the road of health and happiness. The physical condition of the infant depends so intimately on that of the mother that it is a duty of the expectant mother to keep herself as fit as may be physically and mentally.

It is well for a young woman to avoid the information and advice of elderly, gossiping women, who are full of a wondrous lore on the mysteries of maternity, which consists chiefly of foolish and sometimes harmful superstitions. A young woman will naturally consult her mother on some subjects, but she cannot do better than abide by the advice of a reputable authority. Such advice I have tried to furnish. It is no part of its purpose to over-emphasize the discomforts and dangers of pregnancy. Though it must sometimes bring into prominence the painful complications which occasionally and in abnormal cases accompany the functions of maternity, the writer would at the outset insist that these functions are natural and normal, and that in the great majority of cases, where proper hygiene is observed and ordinary care taken, there is the minimum of pain and discomfort.

SIGNS AND SYMPTOMS OF PREGNANCY

The first thing a young married woman will wish to know is the signs by which she may recognise that she is about to become a mother. The earliest symptom of pregnancy is a stoppage of the monthly periods, though it is not an absolutely certain sign, as there is sometimes no monthly flow in young women owing to bloodlessness; still, if it occurs in a married woman who has hitherto been perfectly regular in her menstruation, it is a most valuable indication of pregnancy. It is also by this means that the probable date of the confinement is usually calculated.

It must be remembered, however, that in some women menstruation (or, as it is more commonly called, "periods," "courses," "monthlies," and "being unwell") persists for the first three months of pregnancy, and may thus mislead a person as to her condition, and also throw her out in her calculations as to when the baby is likely to be born. It is very rare for such periods to last the usual number of days, or for the flow to be of the usual amount. It is usually scanty, and does not last more than a day and a half.

Before describing the other symptoms of pregnancy, it would be well first to consider shortly the subject of menstruation. This is a regular flow of blood from the womb, which occurs every month, usually between the ages of fifteen and forty-five. Its occurrence indicates the passing from childhood to womanhood, and its continuance means the possibility of pregnancy taking place. After it ceases there is little likelihood of a woman becoming pregnant. Although a girl may menstruate at the age of fifteen, it does not follow that she is then fit to bear children, as her whole frame is as yet immature, and the bones of the pelvis are not properly developed till after twenty. The best age for child-bearing is between twenty-three and thirty-five. The children of immature people are generally delicate, and resemble in some ways children who have been born prematurely. On the other hand, the children of old parents are also often delicate and wanting in vitality, as though themselves prematurely old. A woman marrying between the ages of twenty and twenty-five has, other things being equal, a better chance of bringing up a healthy family than one marrying either earlier or later.

Once menstruation is properly established it should go on regularly, both in quantity and duration, unless there is something wrong. The usual time between the first day of one period and the first day of the next is twenty-eight days, but the time may vary between twenty-one and thirty days according to the individual. In each person, however, it should be constant in its recurrence whatever the type may be.

The periods stop in about half of the total number of women between the ages of forty-five and fifty, but the "change of life" varies between much wider ages than the onset of the periods. A continuance of menstruation beyond the age of, say, fifty-five, especially if the periods be very severe, usually means that there is some very definite cause, commonly a simple tumour of the womb, which should be attended to. Much more important, however, is a return of bleeding after the change of life has been properly established. This should always excite the gravest suspicion, and at the very first occurrence of any return of bleeding a doctor should be seen, as it is so frequently due to the early stages of cancer. If taken early a great deal may be done, and the woman's life saved by operation; but too often, alas! no attention is paid to it, and months are allowed to elapse before a doctor is consulted, by which time the growth has made such progress that the case is utterly beyond all hope of cure. One cannot be too emphatic on the importance of this point. Of course the symptoms may arise from some minor cause, but the danger is far too great to admit of any delay. A woman who neglects such a symptom for months is virtually committing suicide, and choosing for herself a particularly slow and painful method of doing it.

At the change of life, which indicates the end of the child-bearing period, various alterations occur. They are all physically in the direction of atrophy. The breasts become smaller as regards gland tissue, though they may become more prominent owing to the tendency some women have to grow stouter at this period of life. The whole body may become markedly thinner or fatter. Internally the generative organs atrophy and become small. As there is a great readjustment going on in the system, the general symptoms are sometimes severe. Headaches and giddiness may be very troublesome. A troublesome complaint is the frequency of severe flushings of the face and body which occur at this time. At the same time the nervous system is sometimes in a very unstable state, and some women are the subjects of nervous breakdowns which may last over many months. The periods may stop suddenly and never return. More commonly there are irregularities, a month or two being missed, and then a period comes which may be normal in amount but is usually more severe. Occasionally there are very severe hæmorrhages, which gradually get less till the "menopause," as doctors call the final ceasing of menstruation, is established.

Now what is the reason of this extraordinary process occurring every month in the womb? Many theories have been put forward to account for it. One of the first was the idea that it was the curse which Eve took with her from the Garden of Eden after eating the forbidden fruit. Another old theory was that by means of her periods women got rid of various poisons which were elaborated in their systems.

Much more rational is the modern "safety valve" theory. It is that from puberty a woman is capable of bearing a child, and therefore she builds up in herself sufficient blood to nourish one. If conception do not take place this is got rid of by means of periods, and she starts over again to build up, to be followed again by another period, the process being repeated till she becomes pregnant, when the child is nourished on what would have been cast off in the non-pregnant state.

In support of this view, it is pointed out that during nursing there are no periods, as the excess is used for the nourishment of the child by the breasts. In cases of bloodlessness, too, there is frequently no menstruation, as the woman requires all her blood for her own needs.

Another theory is that the whole process is intended to make the cavity of the womb suitable for the reception of the child at its earliest stages. Whether one takes the view that by the casting off of some of the lining of the womb a raw surface is left on which the membranes around the child can graft themselves, or the view that the lining membrane is thickened so as to make this process easy, and is only discharged if conception does not take place, really matters very little. That it is for the purpose of preparing the womb is the central idea of both views, and is probably the correct explanation of this mysterious process, which continues all through the time of a woman's fertility unless she is either pregnant or nursing, when it is suppressed.

The cessation of menstruation, then, in a married woman is, with the exceptions noted, a sure sign that she has conceived; but even before the cessation has taken place, in some people there are signs of pregnancy which are peculiar to the particular person, such as: increased appetite, a feeling of well-being, a desire for special articles of food, or, on the other hand, headaches, and occasionally faintness. These, however, can be recognised only by women who have experienced them in previous pregnancies.

The next important symptom of pregnancy is "morning sickness," which comes on as a rule after the first period missed. As the name indicates, it usually occurs in the morning, when the woman first gets up. She vomits a small quantity of clear, tasteless fluid, and there may be no feeling of sickness with the vomit—it is merely rejected. Sometimes this occurs in the evening instead of the morning, but should never be more than once in the day. It continues during the second, third, and fourth months of the pregnancy, and should then cease. But it is well to note that in numerous cases there is a feeling of nausea without any vomiting. Should there be vomiting accompanied by severe nausea, or should it continue after the fourth month, or should it recur more than once in the day, it is as well to consult a doctor.

The next symptoms of pregnancy, in order of occurrence, are the changes in the breasts, which usually appear about the third month. Sometimes slight neuralgic pains shooting through them are first experienced. The breasts then begin to increase in size, become nodular, firmer, and more prominent. The veins are fuller and stand out as blue lines. The nipples also become more prominent, and are very sensitive. At the same time they become darker in colour, and a dark ring encircles them, gradually increasing in area till it affects the skin of the breasts. Against this dark background, there is sometimes seen a number of white, raised, pimple-like bodies. If the breast be squeezed or rubbed, a quantity of white, milk-like fluid can be expressed, and often this comes out of itself, and stains the clothes. This sign is of no value in a woman who has already had children, as the milk may have persisted from the previous pregnancy, but it is of the utmost value as an indication in a married woman who has not before had children, as there are very few other conditions which give rise to it.

During the first three months, owing to the heavy womb pressing on the bladder, there is a frequent desire to pass water. This disappears after the fourth month, but occasionally returns in the last ten days before confinement. At the same time, owing to the room in the pelvis being taken up by the growing womb, there is a certain amount of pressure on the bowel, so that constipation may be an obstinate symptom. Owing to the increased amount of blood which is now coming to the pelvic organs, there is apt to be a considerable amount of white discharge. Unless excessive, it can be kept in control by ordinary cleanliness.

The next important symptom is that of "quickening," which may appear as early as the third month, or as late as the fifth. The nature of the movement, which is due to the movements of the child in the womb being communicated to the abdominal wall on which that organ now rests, seems to vary considerably in different individuals. In many it is represented by a pulsation; in some it has been described as "a slight fluttering," while in others the movements may be very vigorous. In many women there is a feeling of movement due to the bowels, earlier than the date of quickening, which may be mistaken for it by a woman in her first pregnancy. It is hard to say how much is really felt, and how much is perhaps magnified by a highly-strung, nervous system, for at this time some women are inclined to hysterical outbreaks.

In women who have had children before, it recurs with remarkable regularity, and is within a day or two each time of the eighteenth week or mid-term (four and a half months). In women who are carrying their first baby, on the other hand, the time when the quickening is first noticed is more indefinite, varying in many cases from fourteen to twenty-one days from mid-term. This is probably explained by their want of knowledge from experience. It is usually recognised late in elderly women with their first child, and a typical example of this is mentioned in the Bible in the case of Elisabeth, the mother of John the Baptist.

The movements become more vigorous as the child increases in size, and may be pleasurable or so powerful as to give rise to some discomfort to the mother, especially at night, and so prevent her getting her proper rest. They seem to bear a relationship to the taking of food by the mother, which always lessens them in vigour.

Quickening has been associated with great fallacies in bygone days, both in connection with the law and the general public. It was generally supposed, and is to a great extent to the present day, that quickening was the arrival of the Soul or Spirit in the developing child. Before this time the child was not considered as separate from the mother. After quickening, however, it was supposed to be a real living being with an identity of its own. This is still seen in criminal or artificial abortion. Most of these criminal miscarriages are brought on between the third month and mid-term, before quickening has occurred. In England formerly, if a woman were condemned to death and had quickened with child, a respite was granted till after the birth. This point of view is entirely wrong, as the child is living as truly from the early days of conception as after quickening; so that for anyone to procure miscarriage before "feeling life" is as great a crime and as much murder as after quickening.

In the later months of pregnancy, owing to the pressure of the enlarged womb, the veins of the leg sometimes become swollen and distended, which may give rise to no discomfort. But frequently they cause pain, and may set up a kind of eczema in the skin over them which may break down to form an ulcer. This can be avoided by the use of an elastic bandage or stocking and resting with the feet up whenever possible.

Among other marks of pregnancy are certain changes in the abdominal wall which make their appearance about the third month, the earliest of which is a dark line which runs upwards to the navel in the middle line. Later, with the growth of the womb, the abdominal wall becomes so stretched that it cracks below the surface, which gives rise to broad pink lines or "striæ." After the confinement, these striæ become white and silvery, and remain as a permanent mark of the pregnancy. They do not always occur in pregnancy, and as they may be caused by any great distension of the abdomen, their presence does not necessarily mean that the woman has had a baby. On the other hand, their absence does not mean that the woman has not had a child.

During the first three months the navel is rather deepened, but by the sixth month it is flush with the rest of the wall. During the last three months the navel protrudes. In later pregnancies the effects of the previous one may have so weakened the abdominal wall that the womb protrudes excessively; this, however, should never be present in a first pregnancy, and if it is, a doctor should be at once consulted as to what is the cause of the extreme prominence, or, as it is technically called, "pendulous belly."

During the whole course of pregnancy, there is apt to be constipation greater in degree than is usual in the non-pregnant state. It is most obstinate at the beginning and at the end, as at those times there is a certain amount of pressure on the bowels. In some women there may be attacks of diarrhœa, which are due either to some error of diet, or the irritation of masses in the bowel—the result of the constipation. The best treatment is a tablespoonful of castor-oil, at any rate to begin with, and patients should be chary of taking any binding medicine with the object of checking the diarrhœa.

All the time of the pregnancy, some women suffer from an excessive white discharge, which is known popularly as "whites"; with the majority of people it is only in the last three months that it may become troublesome. It is of no dangerous import, and can be kept in check by ordinary cleanliness, but should it become troublesome, the doctor should be told about it, especially if at the same time there is any burning pain on passing water, or very frequent desire to do so.

Sometimes, especially in the early months, the expectant mother suffers from headaches, but recourse should not be had to "headache powders" except under the advice of a doctor, as they are usually the result of inattention to food or to bowels.

Another troublesome symptom at times is toothache, which may be, and frequently is, due to defective teeth; but on the other hand it may be present with the teeth in perfect condition, and no tooth should be pulled during pregnancy without the direct consent of the doctor in charge, as such toothache disappears after the confinement. Besides, the mere pulling of a tooth may give rise in some women to a miscarriage. A more unusual mouth complaint is an excessive secretion of saliva, which, when present, is particularly troublesome and difficult to control, even with mouth washes of the most astringent description.

The first thing a woman should do when she knows she is pregnant, is to arrange for a doctor to attend her confinement. She must above all other considerations have complete confidence in her medical attendant. She should consult him as to the probable date of her confinement, and find out what his fee for attending her is likely to be. It is a matter upon which there should be no false modesty, as his fee may be beyond her means, and she had better know at once, so that she may make arrangements with another doctor who charges less. Once this arrangement is made, she should ask him, if it be her first baby, to recommend to her one or two of the nurses who are accustomed to work for him. In this way she is sure to get a nurse in whom the doctor has confidence both as regards ability to nurse and her tact in dealing with the patient. She understands what the doctor will want, and prepares accordingly. If a woman has had a nurse at her previous confinement whom she likes, she need have no hesitation in telling the doctor so, and arranging with her to nurse her again. If not she should have a personal interview with the nurses recommended by the doctor, and take the one she thinks she likes best. She should then arrange with her as to what her fee is to be, and as to when she is to come to the house. Usually a monthly nurse keeps a week clear between each of her cases, so that even if the confinement is a little before its time, she is free to attend it. Some women prefer to have the nurse staying in their house with them for a day or two before the confinement is due, but others prefer to send for the nurse only when the labour has started. As good nurses are booked months in advance, it is wise that such arrangements should be made as soon as possible. Formerly all monthly nurses required to be old, and the larger their own family, the better nurses they were supposed to be. Nowadays the chief consideration is that the nurse should be fully trained and physically well fitted for her arduous duties.

HYGIENE OF PREGNANCY

There is a very common idea that when a woman is pregnant she should spend most of her time resting, so as to avoid the chance of a miscarriage. Perhaps the person most liable to suffer from this delusion is the elderly (in the child-bearing sense) woman of about forty, who has become pregnant for the first time, and knows that her chance of having another child is small.

It is just as bad for a pregnant woman's health to take too much rest as it is for her to take too much exercise, an error into which she rarely falls. The proper amount of exercise cannot be laid down in absolutely rigid hours, as it must vary with the ordinary habits of the woman and her actual physical strength. For instance, a girl who has been accustomed from her school days onwards to regular daily exercise, such as hockey, beagling, and golf, demands far more exercise as part of her daily life than the girl who has never indulged in any of those strenuous games.

A working woman has in all probability quite enough to do in her home life to give her all the exercise that she needs, but in her case there is another factor of almost as great importance, and that is, that through working indoors all day she does not get enough fresh air, which is absolutely essential for her health. In her case, night time is probably the only time that she can get out, and though not the best part of the day, she had better make use of it, for a half-hour's walk, than not go out at all. The girl who has never taken any exercise must learn to do so, and it would be wise for her to start with short walks, say of half an hour at a time during the morning, and again in the afternoon. It will help to tone up all her muscles and make her fitter to stand the strain of her confinement, and still more important, it will help to prevent the constipation which is always associated with pregnancy to a greater or less degree. The athletic girl knows what she can do, and usually tries to live up to it; she may take her usual amount of exercise for possibly the first month, but she will then find that she is much more easily tired, and her common sense will tell her that she must be more cautious, and not overtire herself.

There are certain forms of exercise—the more violent—which must be given up altogether. To this category belong: riding, bicycling, hockey, golf, tennis, and even dancing. In a working woman's life, the most likely thing to produce trouble, either in the way of miscarriage or displacement, is the lifting of heavy weights, or stretching up for things beyond her reach. As the pregnancy goes on, and the womb increases in size, walking becomes more difficult, but is still the best and safest way of getting the requisite exercise. As we have already stated, no definite rule can be laid down for everybody, and each person must use her common sense, and not overindulge in any way.

During the last two or three months of pregnancy walking may be very difficult, owing to the size and weight of the womb. The greatest comfort will be derived at this time from wearing a broad flannel binder or a belt to support the womb, and more or less lift it up. This may sometimes make all the difference between being able to take exercise in comfort and not taking any at all.

On the other hand there is the question of rest. At least eight hours in bed should be regarded as an absolute minimum, and an extra hour will do no harm. At latest eleven o'clock should be fixed as the hour for going to bed. During her pregnancy it is a wise plan, if possible, for a woman to take an hour or an hour and a half in bed, or on a couch, shortly after the midday meal. At the times which would correspond to the periods, were they present, a woman must be particularly careful, as she is more liable to miscarry then than at any other time, especially at the *third* month. This is because at that time there is a development going on of the afterbirth, or placenta, by which the growing child is nourished, and for that reason the woman is more liable to a separation of it and a resulting miscarriage. After this time the same amount of care is not so necessary. In some people, where there is a tendency to varicose veins, these have to be carefully considered in the question of exercise and rest. Such a person must not only rest more than the average individual, but she should also, when resting, have her feet higher than the rest of her body, so as to favour the return of the blood from the leg. She can also help by having the foot of her bed raised on blocks some four or five inches.

After the seventh month, there may be difficulty in breathing comfortably when lying down, owing to the size of the womb, but this can be remedied by propping up the shoulders with pillows.

As regards dress during pregnancy, the main points to be attended to are warmth and comfort, which means that the clothing should be loose and not too light. The stays, if worn at all, must be loosened, so as to exert no pressure on the growing womb. It is possible that tight-lacing at this time has produced that difficult kind of confinement, cross-birth. Accommodation must also be provided for the growth of the breasts. Towards the end of pregnancy the breasts have sometimes grown so big and become so heavy that they may cause the woman a considerable amount of discomfort. In such a case they should be supported by pads of cotton-wool, under a loose corset or a broad domet bandage. Warm, loose underclothing for choice should be worn, roomy combinations, in which there is a certain percentage at least of flannel or wool, and closed knickers.

In regard to the question of sexual relationship, it is wiser after the fourth month for the husband to occupy a separate room, and during the early months he should certainly do so, at the times corresponding to when the periods would have occurred.

During the whole course of the pregnancy, many women find that their appetite has greatly increased. This may be partly due to the idea that they are nourishing a second individual, and is therefore slightly hysterical, but it may be actually due to the demands of the child for nourishment. Though this is only natural, the mother must be careful not to over-indulge, as her stomach is not at its best, as is evidenced by the sickness during the early months. Naturally, this is the time when most care should be taken as to what is eaten and drunk. In controlling the morning sickness it is a wise plan to drink a tumblerful of hot water first thing in the morning before getting up. If retained, it may act as an aperient; if rejected, it serves to wash out the stomach, and if the woman remains in bed for about an hour afterwards she can usually rise and make quite a good breakfast. The hot water may be flavoured with lemon if preferred, or a cup of weak, freshly-infused tea may be taken in its place.

Breakfast should consist of either weak tea or coffee, with some fish or eggs; for those who can take it, porridge and milk, or cream, is one of the best breakfast dishes possible, as it acts as an irritant to the bowel. Many people prefer it at night, and it is even better taken then than in the morning. The midday meal should be the principal meal of the day, and anything may be taken at it which is known by experience to agree. The white meats are preferable to others. For supper, which should not be later than eight o'clock, some light food, such as fish, chicken, sweetbreads, or tripe, should be taken, unless porridge is preferred at this time. It is a good time, too, to take fruit, either fresh or as a sweet. Either at midday or at night some kind of fruit is almost an essential. Many people find they sleep better after taking a tumbler of milk, either hot or cold, and a biscuit just before going to bed. This will frequently be found to be a good thing to prevent the disturbing of sleep due to the excessive movement of the child during the night.

In ordinary circumstances some women suffer from constipation, and during pregnancy this condition is intensified. Not only is it bad for their general health, but it is a common cause of piles, which are liable to appear in any case some time during the course of pregnancy. Every means should be taken to have a regular movement of the bowels every day, and, if possible, without the use of medicines. A tumbler of hot water at night and in the morning helps some people, and porridge is also an excellent aperient. Other articles of diet useful in this way are the seed fruits, such as figs, and prunes are widely known as being excellent. At the midday meal, too, the person may with advantage take green vegetables, which leave an undigested residue, to stimulate the bowels. The best are cabbage, spinach, and Brussels sprouts. It should be remembered that though milk is so easily digested, and therefore so excellent in pregnancy, it has a distinctly constipating effect, which is much increased if lime water is added to it, as is frequently done, as an aid to digestion.

Should medicine be necessary, the mild aperients should be used, and recourse should never be had to such powerful drugs as aloes. Some people find sulphur an excellent drug, either as tablets or as the "flowers of sulphur," alone or mixed with an equal quantity of confection of senna in a teaspoonful dose at night. Cascara is not a very good drug to use in a single dose. If taken at all it should be taken in small quantities three times a day. Liquorice powder is a favourite remedy with some people, but perhaps best of all is the old-fashioned castor-oil. The best way of taking the oil is to squeeze some lemon juice into the glass and rinse it thoroughly round, at the same time rubbing the rim of the glass with the lemon; the oil should be heated till perfectly thin, and then poured into the glass and some more lemon squeezed on the top. If swallowed straight, and not allowed to come in contact with the teeth, it is hardly tasted at all.

Another method of emptying the bowel is to make use of the enema. This is given by means of a Higginson's syringe. The material used should be either plain hot water or with some soap dissolved in it. Sometimes the addition of a tablespoonful of oil helps its action. The only disadvantage of the persistent use of such an enema is the over-distension of the bowel, which occasionally becomes chronic. The syringe, after use, should not be returned to the box, but should be hung up by the weighted end until dry. The amount thrown into the bowel in such an enema should be about a pint, and if introduced slowly it should cause no pain or discomfort. At the beginning the patient usually thinks that she cannot retain it, but if a moment or two is allowed to elapse, and care exercised in the rate at which the enema is given, the full amount can easily be introduced. Another useful injection is a small quantity of glycerine—about a teaspoonful—put into the bowel by a special syringe.

None of those remedies, however, are so good as attention to diet and exercise. Perhaps the most important result of care in this direction is the comparative freedom from piles which a person, whose bowels move regularly, enjoys. They are a most troublesome and distressing accompaniment of pregnancy. They are distended veins at the very lowest part of the bowel, and are caused by the pressure of the womb on the veins higher up, and are intensified by the constipation. They occasionally become inflamed, and the blood in them clots, causing severe pain. Those which are situated inside the bowel—internal piles—are apt to bleed, and though the quantity of blood lost may be small, the result is out of all proportion in the way of depression and feelings of lassitude. External piles, which are situated at the opening of the bowel, do not usually cause so much trouble. Should an internal pile come down after the bowels have moved, it is sometimes caught in the opening, and causes a considerable amount of pain and discomfort. It should be returned at once with the finger covered with oil or vaseline, and care should be taken not to injure it in doing so. One of the best methods of treating them once they have appeared is to sponge with absolutely cold water every time the bowels move, and a small injection of cold water also helps. They can also be anointed with gall ointment, or one of the proprietary ointments such as homocea. As a rule, after the confinement they disappear, but may remain as a permanent cause of discomfort, in which case a doctor should be consulted with a view to their removal. Such an operation is quite unnecessary during the course of pregnancy.

More than ever, during pregnancy, should a woman attend to her personal cleanliness. The skin gets rid of a number of waste products from the system by means of perspiration, and it cannot do this if the sweat glands are blocked up by dirt. At least twice a week a hot bath must be taken, preferably in the evening, as the person is less likely then to get a chill, and it also helps to induce sleep. A tepid bath should be taken every morning, as it has a bracing effect on the general system; moreover it keeps the skin acting, and by cleansing the external genital organs, helps to prevent the itching in that region which is sometimes an uncomfortable accompaniment of pregnancy.

In addition to external cleanliness, something may have to be done to counteract the white discharge from the passage to the womb, which may become excessive, and is a common cause of itching. The best method of treating this is to syringe the passage every morning or evening with water at a comfortable heat for about three minutes. The addition of two or three teaspoonsfuls of alum to the pint of water increases the efficacy of the remedy. It is best given by means of a Higginson's syringe, over the nozzle of which is put the vulcanite douche nozzle which always accompanies it.

Another very good means of alleviating the irritation from the white discharge is the use of a syringe of "bran water." This is made by putting one pound of bran in a cloth with three quarts of water and boiling till half the water is gone. Then remove the bran and dilute the mixture with an equal quantity of hot water as required.

In the last few months of pregnancy perhaps the commonest discomfort to be feared is "heartburn," a burning sensation in the stomach, sometimes accompanied by the rising in the throat and mouth of an acrid fluid. The most effective and harmless way to relieve this is to sip half a tumblerful of water in which half a teaspoonful of powdered bicarbonate of soda has been dissolved.

During the course of her pregnancy, if a woman has any choice, she should occupy the largest and airiest bedroom of the house. It should always have a fireplace, and she should, if possible, sleep with the window wide open, to admit of free ventilation. The room should not be too near a lavatory. The spring mattress is so universal that it is hardly necessary to condemn the foolishness of the old feather bed. Blankets and quilt should be as light as is consistent with warmth.

All the foregoing remarks have had some bearing on the question of miscarriage, by which is meant the expulsion of the contents of the womb before the seventh month of pregnancy. Inattention to the bowels, over-exercise, &c., are all-important factors in the production of a mishap. In addition, some people miscarry so easily that the least thing may cause one. Some, for instance, cannot even go to a theatre or a concert whilst pregnant, owing to this unfortunate result, caused no doubt by the vitiated atmosphere of such places. Any mental shock may have the same disastrous effect, hence the importance of living a quiet, well-ordered life, to avoid such possibilities. Care should be taken to avoid any straining or jolting, so that motoring is contra-indicated. It should be remembered that one miscarriage may be the beginning of a series, so no precautions should be neglected. Such a thing as a "habit of aborting" may be set up, and may be very difficult to cure.

I should like here to draw the attention of all women to the fact that though a miscarriage may be very easily caused in some people, in most it is impossible, short of actual interference by means of some instrument passed into the womb. It is a very prevalent idea that certain drugs are sure to cause miscarriage; any drug will do so if given in such doses that it kills the mother, but short of this nothing is of any use. In any case, no woman is justified in destroying the life of a potential being from selfish cowardice at the thought of the confinement and the upbringing of a child. It is possible that the mental condition of the mother during pregnancy may affect the whole character and future of her child. In any case it is bound to react on her own health. It is well, then, that the patient should endeavour (without fatigue) to occupy her thoughts with interesting and pleasing subjects, and should choose her reading wisely. An expecting mother is not an invalid, and should avoid morbid interest in her own "symptoms."

During the last months of the pregnancy, a woman who is having her first baby can avoid a good deal of trouble during nursing by a little attention to the breasts. The nipples, if not previously prepared, are apt to crack and give rise to considerable pain, and even "gathering of the breasts." The best thing to do is to bathe the nipples daily with eau-de-cologne or whisky, so as to harden them. In this way the suction of the child's mouth is less likely to cause abrasion.

COMPLICATIONS OF PREGNANCY

Let us now consider the various dangerous conditions which may arise during the course of the pregnancy, and give a few hints as to how these may be noticed and the doctor warned of them. It must be remembered that these conditions are the exception and not the rule, and that they can be readily obviated by medical assistance if the doctor is warned in time.

Child-bearing is a natural function, and it is hardly necessary to point out that the overwhelming majority of cases have a normal development with no troublesome complications. By far the most dangerous condition arising out of pregnancy to be found in this country is that in which the expectant mother has fits. Sometimes there are no warning symptoms or signs, but, fortunately, much more frequently there are very definite and grave danger-signals. This condition, for some occult reason, is much more prevalent in Scotland than in either England or Ireland. It seldom occurs except in the course of a first pregnancy. The earliest indication of this condition is swelling, in the morning, of the face and eyelids, so that the patient cannot open her eyes, or she begins to find that her feet are swollen to the extent that she cannot get on her shoes. Or it may be that her hands are so swollen that she cannot get her rings off or her gloves on. Occasionally there is bleeding from the nose. At the same time, if the patient takes notice, she will observe that she is passing considerably less water than usual, and that it is much darker in colour, with frequently a reddish deposit on standing. A little later, or even from the beginning, she will suffer from various nervous conditions, such as severe headache, which is commonly in the forehead, accompanied very often by flashes of light before the eyes, or seeing double. Her sight, too, may become dim. Occasionally there is buzzing in the ears and the hearing affected instead of the sight.

A very valuable danger-signal is persistent and severe vomiting. This should have stopped at the end of the fourth month. One cannot over-emphasize the importance of such symptoms as severe headache and vomiting, and any woman who suffers from these, at or after the sixth month of her pregnancy, should not delay an unnecessary hour in consulting her doctor, at the same time taking with her a bottle containing a sample of her urine. The doctor, by testing it, can tell at once whether there are conditions of danger. The seriousness of this condition can be understood when it is realised that it is a practice for most doctors to request all patients in their first pregnancy to send a sample of their water regularly after the fifth month. During the last two months it should be examined every fortnight. In subsequent pregnancies there is not such a great likelihood of such symptoms occurring, but they cannot be neglected as a possibility. What makes it all the more important to be on the look-out for them is the fact that under treatment the condition may practically always be cured, if discovered before the fits come on.

Should a patient have the early symptoms and not be within easy reach of the doctor, she can help herself very greatly by confining her food entirely to milk and milk puddings made without eggs. This change should not be made too suddenly, but better by substituting milk for two meals on the first day, and the other two the next. She may have to live entirely on milk and nothing else, and in that case, should drink not less than ten tumblersful in the day. She should also take a purge, such as three grains of calomel at night, to be followed by a Seidlitz powder in the morning. The Seidlitz may be repeated for the next three mornings, and in any case constipation should be particularly guarded against. The skin should be encouraged to act by means of hot baths and warm bedclothes, with hot bottles. Should a fit occur, the first thing to be done is to prevent the person biting her tongue by inserting something between the teeth. A doctor must be sent for at once, and pending his arrival the patient should be put to bed and surrounded by hot bottles, which should be placed outside the blanket nearest the patient, as she is frequently unconscious, and may be severely burnt by them, unless this precaution be taken.

One cannot be too emphatic on this subject. The success of treatment, before fits come on, is so great that it should be insisted on that specimens of the urine should be sent at regular intervals to the doctor for testing, whether it is asked for or not, especially if the patient is being troubled with headaches.

Although it is normal for a pregnant woman to have sickness from the second to the fourth months, it may be a source of considerable danger to her if vomiting become excessive or too prolonged. One source of danger is the well-known fact that it may stop at any moment for no apparent reason, and therefore a woman is apt to neglect her condition even when it is at its very worst. Instead of being confined to the morning, the vomiting may be repeated at intervals during the day, and in such a case is accompanied by a feeling of sickness. As it gets worse, the sight of food and even the smell of it may induce vomiting. Naturally the patient becomes thinner, and owing to the interference with the heart's action she begins to suffer from coldness of her feet and hands. Frequently there is a complete cessation of the vomiting, and during this interval she very often suffers from a desire for some extraordinary article of food. The danger-signal which should be kept in mind in these cases is *a rise of temperature in the evening* which is *accompanied by an increase in the rate of the pulse.* If a patient is not attended to she is in danger of passing on to a state of collapse with severe nervous symptoms, such as delirium or even unconsciousness.

The condition may be due immediately to pregnancy or may arise from stomach trouble in the mother, the pregnancy acting as the last straw. Sometimes it is purely hysterical, and at other times has been found associated with a displacement. It is always more marked where the womb is over-distended, as is general in the case of twins.

The condition is much more dangerous than it is given credit for by the patient herself, although if taken in time it is fairly easily treated. As one would expect, one limits the diet to the most easily digested food, milk being the best thing to take. The bowels should be attended to, and if these measures fail a doctor should be called in, owing to the possible gravity of the condition.

Nature's method of cure, and it frequently occurs, is the somewhat drastic one of a miscarriage, brought on by the severe and incessant vomiting, causing a separation of the ovum in the womb.

A miscarriage takes place when the contents of the womb are expelled before the seventh month of the pregnancy. After that period, if labour come on before full time it is known as "premature labour," as the child is now able to live if born. A miscarriage may occur with very little discomfort to the mother at the time, but it may be the starting-point of trouble for the rest of her life. Too often it leaves behind it a chronic inflammation of the womb which prevents her becoming pregnant again, and if she does so, is apt to lead to another abortion. The amount of bleeding at the time may be worse than at a full-time labour, and thereby so weaken the mother that she is very susceptible to blood-poisoning, which in her weakened state may easily prove fatal, or set up such inflammation in the pelvis as to preclude the possibility of her having more children.

The causes of the condition are very numerous, and vary in different women. Some women have not the slightest tendency to miscarry, whereas others do so on the slightest upset. The symptoms of it are pain or bleeding or both. It is rare for pain to come on without some bleeding, but it frequently happens that there is bleeding without any pain. If taken in the early stages a miscarriage can generally be prevented—hence the importance of having it treated as soon as there is any suspicion of danger. It usually starts with a feeling of weight in the pelvis and of down-bearing, very similar to what occurs in so many people at the time of the periods. It is worse, however, and gradually increases in severity, the pains coming on at intervals and being felt more intensely in the back. The bleeding, at first sight, becomes more severe, and numerous clots are passed. These clots should on no account be thrown away, but should be kept for the doctor's inspection, otherwise he cannot tell whether any essential part has been discharged or not. Should the miscarriage begin with pains, the doctor should be sent for without waiting until the bleeding starts to make the diagnosis certain. Should it commence with bleeding he must be sent for immediately, as he can do more at the very beginning than at any other time. In the treatment of a miscarriage the old motto, "Prevention is better than cure," is of the utmost value, and has been treated of in the section on the Hygiene of Pregnancy. Should it have started, the patient may help herself before the doctor's arrival by going to bed and keeping perfectly quiet. She would be well advised to take a dose of castor-oil and to limit herself to a diet of fluids and milk puddings.

I have already referred to the importance of keeping what has come away for the doctor's inspection. The reason of this is that unless the whole of the products of conception are discharged, a good deal of trouble may arise from the parts retained in the womb.

Occasionally married women suffer from what they call "delayed periods." Instead of becoming unwell on the proper date they are a few days late, and the period is rather more profuse than usual. This is really a very early miscarriage. It is usually the result of some congestion of the womb, and a slight operation may be necessary to cure it.

There is another condition which has frequently some of the symptoms of a miscarriage, viz. bleeding and pain, and is often mistaken for one. It is accompanied, however, by a constant pain in the side, or this may be present without the other symptoms. Such a pain should be at once reported to a doctor. If this is neglected the complication is such that severer symptoms will soon set in, such as violent pain and sometimes vomiting. The patient feels faint and wishes to lie quite quiet, with the knees drawn up to avoid the pressure of the bedclothes on the stomach. She may feel feverish. As the condition is very dangerous and can only be treated by an operation, it is imperative that a doctor should be called in immediately.

Yet another, though a very rare, complication of pregnancy also requires imperatively the aid of a doctor. The symptoms are obstinate constipation, pain in the back and down the legs like sciatica, and more prominent still an interference with the action of the bladder. There is first of all a retention of the urine which is not particularly remarked by the patient. When the bladder becomes overfilled, small quantities of water, which are really the overflow, are continually being passed. At the same time the abdomen becomes swollen and painful, and over the swelling there is distinct tenderness. The condition is so uncomfortable that a doctor is usually sent for before there is much danger, but if neglected the patient may lose her life, through the inflammation of the bladder which follows on the over-distension.

The most important disease which may complicate pregnancy, but in no way arising out of it, is consumption. A consumptive woman should not have children. Even if she should suffer no harm herself from the bearing of a child, she ought to know that she may hand on to her baby a liability to develop the disease. Should such a woman become pregnant, she usually experiences an improvement in all her symptoms and thinks herself much better. The disease does not seem to make any progress until after the confinement, when the drain on her system may cause it to develop with amazing rapidity. Still more dangerous is it for the mother to nurse the child, as the constant drain of nursing so weakens her that the disease makes rapid strides.

During its development inside the womb, the baby is surrounded by certain membranes, but between the child and those membranes, so as to keep them apart, there is a quantity of fluid which is very like water. Where it comes from is not very well known, but its value to both the mother and the child is really very great. At the time of labour there will be generally about one or two pints, but the amount varies within considerable limits. One of its functions is to protect the baby from injury. Another important use it has is that it distends the womb to a size bigger than the child, and this enables the latter to have free movement of its limbs and thus to grow properly.

In labour, too, it performs a most important function, in that it is pushed down through the neck of the womb to dilate it, and any dilator which depends on fluid properties is the most perfect, as the pressure is equally distributed all round, and there is no tendency for any one part to become stretched at the expense of the other. As a rule it is only after the mouth of the womb is fully dilated that the membranes give and the fluid which is in advance of the child's head is discharged. The rest of it in an ordinary case is retained behind the child's head, and there it serves an equally useful purpose. The child depends for its very existence on the circulation of its blood through the after-birth, where it comes into very close relationship with the blood of the mother, and from the latter obtains not only nourishment but a fresh supply of oxygen, which is essential for its life. At the same time it passes on to the mother's blood the waste products of its own tissue changes. During the labour pains the wall of the womb contracts powerfully, and if there was no fluid would squeeze the after-birth against the child, and so prevent the blood flowing through it and stop the oxygen going to the child's blood, with possibly fatal consequences. The intervening fluid prevents this, and allows of sufficient blood to pass through to enable the child to subsist till the pain passes off.

Now in certain cases the amount of fluid becomes excessive. If it occurs during the early months it usually produces a miscarriage, and is therefore not frequently diagnosed. Usually, however, it occurs in the later months of pregnancy.

It is noticed most frequently in women who have had children before, and is rare in a first pregnancy. It is frequently found in cases of twins, associated with one of them, and it is more commonly found in connection with girls than with boys. The symptoms it gives rise to are mainly those of distension and unusual pressure. The patient herself notices that she is much bigger than she should be, being the size of full time, when she is perhaps only at seven and a half months.

As a result of the distension she is apt to have a return of her sickness, which may be very severe. Owing to the pressure on the lungs she is much shorter of breath than she should be, and as the stomach is not allowed proper play indigestion is common. Pressure on the heart, too, sets up palpitation, and by this means also the return of the blood by the large veins in the abdomen is hampered, so that any tendency to varicose veins and swelling of the legs is greatly increased. Owing to her size, the poor mother has much greater difficulty in getting about than she should have.

The doctor should be informed beforehand of symptoms pointing to the presence of an unusually large amount of water, as the labour may set in prematurely or may have certain slightly unusual features, the danger from which the doctor can readily obviate if he is forewarned.

An abnormal increase in size in the *early* months of pregnancy should be reported to the doctor. It may merely mean that the pregnancy is more advanced than was suspected (as in cases where the periods have continued during the first three months) or it may point to the presence of an overgrowth of the membranes surrounding the child, when an early operation will be necessary. In such a condition the mother usually suffers from a watery kind of discharge which is frequently tinged with blood, and occasionally there come with it a few bodies which range in size from a millet seed to a small grape. They are whitish in colour, and about the consistency of a grape. Though the mother is of the size of sixth months, she has felt no life. The excessive distension of the womb causes, as a rule, the morning sickness to be very severe, and may even lead to dangerous vomiting.

The most anxious thing about such an overgrowth is that within a few months after it has been taken away there is apt to be a return of the growth. So a woman who has had such an operation must be very careful to see that her doctor is notified as to the behaviour of her unwell times for twelve months after. If the period should be excessive, then steps will be immediately taken to ascertain if there is the beginning of this growth, and if so another operation is necessary to save the woman's life. The results of operation early in such cases are most excellent, there being a complete cure and no recurrence of the growth elsewhere, as it is apt to do if operation is delayed too long.

One of the more serious conditions complicating pregnancy, but not due to it, is heart disease. Unless the doctor is told about it beforehand by the patient—if she herself knows—or he has attended her previously and has thus found out there is something wrong with her heart, it is apt to be overlooked till far on in the pregnancy or even after the labour. It is then an extremely dangerous condition. The commonest heart condition is the result of rheumatic fever, and any person who has suffered from this, especially if she has had two or more attacks, should tell her doctor about it, so that he may examine her and find out whether her heart is affected. Some heart conditions are so bad that a patient suffering from them is not fit to risk the danger of child-bearing, while in another kind of heart disease the danger is done away with altogether by the use of chloroform. A doctor alone can judge of the state of a patient's heart.

It is a strange fact that a woman in the early stages of her pregnancy seems to be more or less immune to scarlet fever, and very rarely contracts it, but after her confinement she is very susceptible to it in a dangerous form. Some doctors hold that the woman really contracts the disease earlier, but that owing to the pregnancy it lies latent in her system till after the child is born, when it makes its appearance. I fancy it is more likely that owing to the strain of her confinement, the loss of blood, and the raw surface inside the womb occasioned by the separation of the after-birth, the woman is after her confinement especially liable to the disease, and unless disinfection of the house has been absolutely perfect, a matter of great difficulty, she contracts the fever quite freshly. It may affect her in the typical way, the inflammation of the tonsils being a very marked feature. Scarlet fever also gives rise, by way of the womb, to one of the most dangerous varieties of "child-bed" fever. Therefore if a case of scarlet fever occurs in a house or district where a woman is pregnant, it is much safer for her to leave the district altogether and go elsewhere for her confinement. She will have to be particularly careful as to her clothes, &c., in the way of having them disinfected. This may seem a hard saying, but the danger to the mother is so great that no trouble is too much to take in order to avoid this serious complication.

LABOUR

Let us now pass to the consideration of how to calculate when the baby is likely to arrive. In those people who previously have been perfectly "regular," the usual method is wonderfully accurate. We take the first day of the last "period" and then count nine months and one week forward. The date thus obtained will be under ordinary circumstances the earliest date when the baby may be expected. Another way is to count three months backwards and then a week forward from the first day of the last "period," and this gives the date, a year from which the confinement may be expected.

It must be remembered, however, that though this is the normal method of calculating, some women persistently go beyond their time, whilst others are always earlier. In the latter case, one finds that generally such a woman has an interval from the first day of one "period" to the first day of the next of only twenty-one or twenty-three days, instead of the usual twenty-eight day interval. Another cause of miscalculation is the fact that some women menstruate during the first few months of their pregnancy, and may thus be thrown completely out of their reckoning. This should not occur if notice is taken of the fact that those "periods" rarely last so long as an ordinary one, and they are usually diminished in amount as well as in time.

One is constantly meeting with women who have become pregnant at a time when their "periods" were absent or very irregular. The usual cause of this is that the mother is nursing at the time, and for that reason does not menstruate. This is a particularly common cause, owing to the prevalent idea that whilst a woman is nursing she cannot become pregnant, and many women continue nursing long after the baby should have been weaned, with the idea of thus lessening the number of their family. How much truth there is in this belief it is difficult to say, but it is certainly not an infallible preventive of conception. It is probable that it has some effect in this direction, but when one considers the run-down condition of a mother after prolonged nursing, one realises that she is endangering her health in any case, quite apart from the fact that if she do become pregnant, she is not in a really fit condition to carry another baby. In other cases the absence of "periods" is due to bloodlessness, which is particularly common in young women.

Whatever may be the cause, the absence of "periods" makes the calculation of the confinement more difficult, and we cannot be so certain of the probable date as in women who have a "regular" history to guide us. In those people there are two methods of arriving at the probable date. The first, and a very useful one in women who have previously had children, is the date of quickening. This, as we have already said, occurs for the first time almost constantly at mid-term. From the date of quickening, we count forward four months and three weeks. It is, of course, of little value to a mother who is having her first baby, as she may make a mistake in realising when first the movements of the baby are felt. Another method in such cases is to calculate from the size of the womb. At the end of the third month it is just rising out of the pelvis, and at the sixth month it has reached the level of the navel. By counting forward three months and a week from the latter date we arrive as nearly as possible at the probable day of confinement.

If there be a choice of bedrooms in the house, the expectant mother should take the biggest and airiest of them for her confinement. She is going to be confined to it for a matter of three weeks, and it is important that it should be of sufficient size, and well ventilated. If possible it should look to the south, so as to enjoy all possible sunlight. It should not be overcrowded with furniture, and a carpet is preferable to a polished floor and rugs (though the latter is really a better hygienic condition), because of the quietness which is essential for the convalescence of a mother after the ordeal of her confinement. Good ventilation should be ensured by means of a fire, and on no account should gas fires be used if their use can be avoided. Sufficient fresh air can be admitted by the windows without lowering the temperature of the room too much. The room should be near, but not next door to, the bathroom, for the convenience of the nurse. If there is the slightest suspicion that the drains of the house are not in perfect order they should be tested at once, as bad drains are a fruitful source of "child-bed" fever. Shortly before the date of the confinement the mother's room should have a thorough "spring cleaning." If the floor is covered with linoleum or any washable material, this should be washed with a disinfectant. If a carpet is going to be used it should be freshly cleaned.

It is best to have the nurse's room next the patient's, when this can be done comfortably, and some means of communication such as an electric bell should connect the two. The nurse can have her meals there and keep the baby there during the night, only taking it in to the mother at the proper times for nursing. By this means we ensure the mother's having a proper rest during the night, and the child is invariably properly trained before the nurse leaves. On the other hand a patient may prefer to have the nurse's bed in the room, and dislike to feel that the baby is away from her. In such a case it is well to provide a room for the nurse to dress in, keep her clothes, &c.

The size of the bed is really a matter for the patient to decide for herself, but it is undoubtedly more convenient for nursing if it be a single bed. I think, however, that most women prefer a double bed, as it allows them to move about more, and is therefore rather a comfort. It is best made of brass, and the mattress should be a hard one on the top of a spring one. Nothing more awkward than a soft mattress at a confinement can be imagined.

As the mother is to be in bed for some time after her labour, it is essential that she should have a comfortable bed-pan. By far the most convenient pattern is the slipper shape, and additional comfort may be obtained by the use of flannel covers which can be removed and washed when necessary.

During the last fortnight of pregnancy there are occasionally signs that labour is near at hand. During this time the womb sinks down lower in the stomach, especially in a woman with her first baby. The result of this is that the patient experiences much greater ease in breathing, and frequently her digestion improves considerably, and there is not the same tendency to palpitation. The drawbacks, however, are that there is greater difficulty in walking, and any tendency to varicose veins is exaggerated. At the same time constipation is more marked, and there is frequently a considerable amount of trouble with the bladder in the way of frequency of passing water or inability to retain it at all. During the last week there is usually a considerable watery white discharge.

Just before labour begins this is frequently tinged with blood, and is known as the "shows"; after its appearance labour usually sets in within twenty-four hours. The first sign of labour is the occurrence of "pains." These pains are due to the contraction of the womb in the process of expulsion of the child. It is most important to distinguish between those true pains and what are known as false pains. The latter are not due to the womb at all, but are usually caused by griping, the result of either dyspepsia or constipation. They can be distinguished from each other fairly easily by a woman who has already had children, but the mistake may easily be made by a woman before her first confinement, with the result that the doctor is sent for when there is no necessity. False pains come on about a month before full time; they are irregular in time and are confined to the abdomen, never affecting the back, and there is usually a history of constipation associated with them. If the hand be placed on the stomach over the womb whilst one of those pains is going on, the womb remains soft, whereas in a true pain the womb becomes hard and tense. False pains are easily and speedily cured by an aperient or an enema. True pains are regular and are felt at first in the abdomen, but soon pass round to the back and loins. At first they are short and slight, and there are wide intervals between each pain. They last about half a minute and occur about every quarter of an hour; gradually they increase in severity, become longer in duration, and are separated by shorter intervals.

When labour is fairly well on there is just about five minutes between each pain, and they are now down-bearing in character. The intermittent nature of the pains is most important for the mother, as it allows the child's head to become accommodated to the mother's pelvis, prevents exhaustion of the mother, and allows of a certain amount of softening of the parts, which do not become swollen and torn as they would if the pains were constant. The pains continue until the womb has emptied itself of the child, and the structure known as the "after-birth," with its attached membranes.

Not infrequently there is a certain amount of blood-stained discharge with the pains, but this symptom need give rise to no alarm unless the bleeding is really severe, when the doctor should be communicated with at once. The nurse should see that there is hot water for the doctor to wash his hands, and most doctors like to find a *new* nail-brush for the purpose.

As soon as the confinement has started, the nurse should prepare the bed with a view to cleanliness and dryness. It is best to have two sheets of waterproof material, one of which extends practically the whole length and breadth of the bed, and is placed next the mattress. Between this and the under sheet there should be an old blanket, otherwise the patient is apt to feel the chill through the sheet. On the top of the under sheet place a small piece of waterproof, three feet broad, and long enough to go right across the bed and be tucked in on the other side. Over this one put another sheet, folded so as to cover the waterproof. This is known as the draw-sheet. Between the draw-sheet and the patient there is frequently placed a sheet of cotton-wool enclosed in gauze; this is about a yard square and about two inches thick, and is pinned to the draw-sheet so that about six inches of it hang over the right side of the bed. It is of the greatest value in absorbing discharges at the time of the confinement, and being cheap, several should be got and used during the course of the labour. The bedclothes should be as light as is consistent with warmth, and towards the end of the labour should be folded over out of the way towards the unoccupied side of the bed. The carpet should be covered to the right of the bed and slightly underneath it by a bath mat or any other protection. A small foot-bath should be kept handy as a receptacle for discharges and soiled dressings, &c. After the confinement is over, the cotton-wool square is burnt, and the draw-sheet and upper mackintosh are easily removed without disturbing the mother to any great extent. She has thus a comfortable, dry bed to lie on, without the fatigue of having to get it made.

People who cannot afford the expense of mackintosh and sanitary sheets can always prepare to a certain extent by having substitutes for them. Strong, glazed brown paper does uncommonly well instead of mackintosh, and for the sanitary sheet one can use a clean rough towel. The floor round the bed can be covered by old newspapers. The bedclothes should all be washed the week before the confinement is due, so as to be ready for putting on after labour.

When the confinement begins the woman should put on a flannel night-dress, and it is advisable to wear under this an old flannel petticoat which has been recently washed and is not going to be used again. When the labour is at the second stage, the night-dress should be rolled up and pinned in position a little above the level of the waist. In this way the night-dress may remain unsoiled, and after everything has passed the petticoat can be removed, and there is no necessity to change the night-dress.

As the patient is so lightly clad, it is imperative for her bodily warmth that there should be a good fire burning in her room, and it is also useful for having a plentiful supply of hot water. The first thing a good nurse sees to is that there is a sufficiency of boiling hot water and boiled water which has been allowed to cool. This is absolutely necessary without exception at every confinement as a precaution, owing to its enormous value in the treatment of bleeding after the delivery of the after-birth. Almost anything else can be done without, but one never knows when the necessity for the hot water may arise, and it is wanted in a great hurry if needed at all.

As a rule the nurse will see to the presence of certain antiseptics, but in case of accidents it is as well for the patient to have some in the house. Probably the most generally useful antiseptic she can purchase is lysol. It is not only powerful and very concentrated, but it is also soapy and acts as an excellent lubricant.

Labour is divided into three stages, and usually lasts in all anything up to twenty-four hours in a first confinement, and twelve to fifteen in subsequent labours. *The first stage,* which lasts as a rule about eighteen to twenty hours, is the stage of dilatation of the neck of the womb, and its end is usually marked by bursting of the membranes and the discharge of a certain amount of water. *The second stage* is the stage of expulsion of the child, and ends with its birth. It lasts from one to three and a half hours. There is then usually a rest, varying from five minutes to a quarter of an hour, when the pains return, but with considerably less severity. About ten minutes after that the after-birth is expelled, thus completing the *third stage,* and the entire confinement.

When the " shows " appear, the woman would be well advised to take a full dose of some opening medicine, preferably castor-oil; or the bowels must be emptied by means of an enema. It is essential for the cleanliness of the patient, and if not given, the full bowel is a potent cause in delaying the labour. During this first stage, the woman is better up and moving about than lying in bed. She should not attempt to help herself at this time by " bearing down," as it only exhausts her and serves no useful purpose. She may take any fluid nourishment in the way of milk or soup, but should take nothing solid, as she will probably be getting chloroform later on, and she will take it much better on an empty stomach. The doctor should be sent for as soon as labour has properly started, if it be during the day, though there is no necessity in a first infant to disturb him at once should the labour start in the early hours of the morning. On arrival he will ask about the pains, and will examine the patient to ascertain how far on the labour is, and whether everything is normal.

The patient can help the doctor in this examination to a great extent by avoiding straining, and leaving herself as slack as possible. It is not, as a rule, at all painful, though rather uncomfortable. Afterwards she should ask him how she is getting on, but it is no use inquiring how long the labour will last, as he cannot possibly forecast it with any degree of accuracy at this early stage. After the " waters " have come away and the second stage has started, the patient goes to bed and remains there from now onwards. She can now help herself by " bearing down " during the pains, and is assisted in doing this by pulling on a towel tied to the head of the bed. The pain during this stage is at its worst, and is felt mainly in the back. It can be relieved to a certain extent by the nurse pressing over the seat of the pain with her hand. When the after-birth comes away, there is always a certain amount of bleeding which is rarely excessive in amount, though when it is, it is one of the most dangerous complications of labour.

Nowadays, by means of chloroform in the late stages and the use of a certain drug, " scopolamine," which the doctor may inject under the skin in suitable cases in the early stage, the pains of labour can be mitigated to a great extent, and a confinement is robbed of half its terrors. As a result of the lessening in pain, women now make a much quicker convalescence than formerly, as there is not the same amount of nervous exhaustion.

In women who have already had several children certain pains, known as " after-pains," are apt to come on about an hour after the confinement. They are of no importance, but are distinctly uncomfortable, and should be mentioned to the doctor, as they can be speedily relieved.

Some women suffer considerably from sickness during the course of the confinement; it is of no dangerous import—in fact, rather the reverse—and has given rise to the saying, " A sick labour is a quick labour," and in past days it was even induced by giving emetics.

If by any chance labour should be so speedy that the baby is born without either the doctor or the nurse to help, the mother should lie as quietly as possible with the child beside her. The only thing she can do is to see that the child's breathing is not hindered in any way, and that it is kept warm. This is a very rare occurrence, and usually happens in those women who have what are called " one-pain labours."

For the reception of the infant certain preparations must be made. The nurse will have in readiness three short, strong pieces of double linen thread to tie off the cord which connects the child to the after-birth.

She will also have a square of old flannel ready warmed in front of the fire to wrap the child up in to keep it warm until such time as the mother is made comfortable, when the child can be bathed. Generally in a baby's basket there will be ready laid a complete set of clothing for the child, with vaseline, starch powder, olive oil, a needle and thread, safety pins, boracic lint, all of which the nurse requires for the infant's first toilet. The baby's soft sponge and special soap will also be ready to hand. The most convenient bath for the baby is a fairly shallow foot-bath, though almost anything in the shape of a large basin will do.

The water should not be so hot as the bath for an adult, a temperature of 100° F. being about right, but one can judge as well by the feeling to the hand, which should be easily borne in it as long as one cares to keep it there. Before washing, the child is rubbed all over with olive oil to aid in the removal of the white greasy substance which covers the child in a layer which varies in thickness. It is then thoroughly cleansed by means of a piece of soft flannel and soap. Practically any well-known soap will do, apart from the coarser varieties, such as carbolic soap. Special attention must be paid to all folds of the skin, such as the groins, arm-pits, buttocks, and genitals, as if any of the whitish material which covers the child is left, it decomposes and sets up an irritation which inflames the skin and may lead to the formation of sores. The child is then dried with a soft towel and all apposed skin surfaces are plentifully sprinkled with some soft powder. Starch powder is the simplest and safest.

The cord which is left at the navel is next attended to, and very rarely in these days of antiseptics gives rise to any trouble. It is usually freely dusted with boracic powder, and surrounded by dry boracic lint, after which it is folded up on the baby's stomach and kept there by means of the flannel binder which is wrapped round the child's waist. This binder is kept in position by being sewn together at the ends, and should never be pinned. Before applying it the cord should be carefully looked at to see that there is no suspicion of bleeding from it. The small piece of cord dries up, turns hard, and drops off usually about the fifth day, but may be a few days later if it is at all thick. Should the cord become moist and soft, it means that it is decomposing and usually smells rather unpleasant. It is then a source of danger to the child. Immediate steps should be taken to cure this, and the most efficient line of treatment is to keep it dry by means of antiseptic powders and dry antiseptic lint or gauze. In these cases, when it drops off it is apt to leave a raw, unhealthy surface at the navel, which must then be treated in a similar way.

The essential points in the baby's clothing are that they be warm and not too tight. The binder has already been referred to and need not be further discussed. Diapers should be of soft towelling, so that they may be washed and still remain soft. The rest of the clothing should be merely of flannel, which is the warmest and lightest material to be had. Apart from the face and head the child should be completely covered, as exposure to cold is a dangerous thing for the infant. It requires heat just as much as food, if it is to thrive properly. A typical case in point is the baby born before full time, which is usually easily enough fed, but difficult to keep alive owing to the constant protection from chill which is absolutely necessary.

The baby is then put into a cradle or in beside its mother. The former is really preferable, and a proper heat can be maintained in the cradle with the help of hot bottles if necessary. There is no objection to the mother having the baby in her bed in the daytime unless she is going to sleep. Most mothers enjoy having the child near them, and so long as they are careful to allow it plenty of space to breathe fresh air no harm is done; but whatever may be done whilst the mother is awake, it is wiser to put the baby into the cradle if the mother is likely to sleep. In her sleep she may overlay the child and suffocate it, or by merely pulling the bedclothes round herself she may cover the child's mouth and so stifle it. Another powerful reason for making the child sleep in a cradle at night is that, rather than listen to the baby crying, the mother will often feed it to quiet it, and so get it into bad habits which ruin its digestion and at the same time disturb the sleep of the mother, which is so necessary for her speedy recovery.

The nurse should not have the baby to sleep in her bed. She is less likely to be nervously apprehensive of overlaying it than the mother. No good nurse will attempt it; still less should she resent a mother objecting to it.

As there is a considerable amount of blood-stained discharge, known as the "lochia," for five or six days after the labour, the mother must be prepared for it with a proper supply of diapers. Probably the best kinds to use are any of the sanitary ones, which are made of cotton-wool enclosed in antiseptic gauze, and are burnt after use.

After the labour is over, the muscles of the stomach are left in a relaxed and flabby state. The mother derives great comfort from the application of a "binder," which is composed of strong cotton sheeting long enough to go round the patient and overlap at the ends by a foot or more. It should extend from an inch or two below the hips to two or three inches above the navel. It is secured by safety pins, and is fixed tightly below and more slackly at its upper border. It is commonly believed to be of great service in restoring the mother's figure, but whether it really does any good in this way seems exceedingly doubtful. There is no doubt, however, as to the comfort this support gives.

CONVALESCENCE

As soon as the after-birth has come away, that period of convalescence from the confinement begins which is known scientifically as the "puerperium." It is the period of repair from the effects of child-birth, and a return as near as possible to the conditions existing before pregnancy. The whole process takes a considerable time, generally about six weeks.

The day after confinement the womb is bigger than it was immediately after the delivery, as by this time there is no danger of bleeding, so that it can relax quite safely. It is then a little above the level of the navel. Steadily, each day, it should decrease in size, until about the twelfth day it should have returned to the pelvis and is not to be felt in the abdomen at all. It is at the very least six weeks before it has returned to its proper size. How this is brought about is not yet known, but there is presumably some change in the muscle wall of the womb which enables it to be absorbed to a certain extent by the blood stream and so be carried away.

Very commonly, immediately after the confinement is over, the patient begins to shiver and complains of cold and chill. This is of no great significance, as it seems to be reactionary in nature, and if a warm drink is given, an extra blanket put over the patient, and a hot bottle placed in the bed, it passes off in a minute or two.

Immediately after labour the temperature may be one or two degrees above normal, but in the course of a few hours it sinks to subnormal, and then gradually comes back to its normal pitch.

For the first few days it may vary between 98° F. and 100° F., but after the third day it should not be above 99° F. The unstable state of the mother allows very slight disturbances to cause transient rises, however, and mere excitement may cause the temperature to run up in an extraordinary way. It is usual to see a rise, which may be slight or great, on the third day, when the milk makes its appearance in the breast. High temperature from such cases does not affect the convalescence of the mother in any way, but it is an entirely different matter when it keeps up for twenty-four hours at a stretch or rises regularly day after day in the afternoon or early evening. This is a distinct sign that something is wrong, usually in the way of child-bed fever, which we will refer to later.

The pulse is usually faster than normal after the confinement, but should be below 100, unless the patient has had a fairly severe hæmorrhage, in which case it may be very fast. It is always well to know what is the rate of the pulse under normal conditions, as some women have a pulse of 100 always, so that the nurse or the doctor may be quite misled by it, unless they are aware of this peculiarity. About six hours after labour it should be whatever is normal for the individual, usually 70 to 80, and should remain so during the rest of convalescence. It is not subject to the same variations as the temperature, and is a far more reliable guide to the state of the woman's health.

For the first two or three days the mother has not much appetite as a rule. She is usually thirsty at first, and can be given a drink of hot milk or tea very soon after the confinement is over. The diet for the first two days is mainly fluid, both because of the help it is to the milk and because the digestion at this time is not at its best. On the evening of the second day or even sooner a dose of opening medicine should be given, preferably castor-oil taken as prescribed elsewhere with lemon, or orange juice, which is not quite so acid as the lemon. The dose used to be delayed, as it was thought to check the milk supply if given before the latter was established, but it does not seem to have any effect in this way, and is better given not later than forty-eight hours after the delivery. Thereafter the bowels must be kept acting regularly, if necessary by the use of aperients or enemata.

Usually there is an increase in the amount of water passed for the first two or three days, but after that it comes back to the ordinary quantity. Troubles with the bladder will be referred to later on in this section.

The discharge from the womb after the delivery, which persists for some three weeks, and is known as the "lochia," is associated with the discharge of the thickened lining of the womb which is present all through pregnancy and does not come away entirely with the after-birth and membranes. For the first day the lochia consists mainly of blood, usually fluid, but often in small clots as well. It then gets somewhat thinner and darker, but is still mainly blood. By the end of the seventh day all the blood should have disappeared, and the discharge is then yellowish, and gradually diminishes in amount till it disappears at the end of the third week. It has a somewhat heavy and sickly odour, but should never be foul-smelling, unless some change is taking place in it which is abnormal. If it is too profuse or is suddenly suppressed it means that there is something wrong, and the cause thereof must be looked for. It is best received on sanitary towels or pads of cotton-wool which can be burnt immediately after removal, but if the nurse is at all suspicious of anything wrong the last one should be kept till the next is changed, so that the doctor may see the latest for himself when he comes, and judge as to the condition of the discharge.

After the discovery of antiseptics there was a great diminution in the amount of fever in our Maternity Hospitals, where epidemics of it used to rage. To prevent this it was customary for some time to douche all women, whether the temperature was above the normal or not, with some antiseptic, such as corrosive sublimate or carbolic. This has been found to be of no use in the ordinary normal case, nay, is even a disadvantage, so now it is never carried out unless there is some indication of the need for it. The way to prevent infection is by cleanliness and the use of antiseptics during the confinement. In douching, a patient may easily become infected with the nozzle, and harm done instead of good, unless proper precautions are taken.

During the first few days the private parts should be frequently swabbed with some antiseptic, such as corrosive sublimate, especially after the bowels move or water is passed. Later corrosive sublimate may be too strong and act as an irritant, so boracic, which is much milder, can be substituted for it.

As a general rule a woman sleeps very well after her confinement, as is only to be expected when one considers the prolonged period of pain she has passed through. If she sleeps badly it is a symptom of considerable importance to let the doctor know about, as it is quite frequently the first sign of various disorders, though sometimes mere excitement may prevent sleep for a few hours. A patient should be kept very quiet for at least a day or two, only her husband or very near relatives being allowed to visit her; but there should not be any darkening of the room in accordance with some old superstition about a strain on the eyes.

The next question to be considered in a normal convalescence is, when is the patient to sit up in bed, and later, be allowed out of it for a little? This matter has been brought into prominence in the past two or three years by various Continental doctors, and in this country by Dr. Haultain of Edinburgh. Formerly every doctor without exception kept his patients in bed for at least ten days, and in many cases three weeks, only allowing them to sit up in bed a day or two before they got up.

The "New School" allow their patients to sit up in bed on the second day, and to leave bed for half an hour or so on the third or fourth. The time they are allowed up is increased by an hour a day till they are up all the time; but a rest of two hours is insisted on every day after the midday meal. They claim for this treatment that it prevents the woman's losing her muscular strength, which an enforced rest of three weeks invariably leads to. Therefore these women are much fitter and make a far quicker recovery than they otherwise would. Secondly, it helps the drainage of the womb, and lets the lochia get away more freely. Again, should any clot be present it is discharged when the woman gets up, instead of lying in the womb for a much longer time, and so acting as a suitable medium for the growth of germs and predisposing to child-bed fever. Also, it helps the circulation greatly, and in this way there is less liability in the woman who gets up early to complications such as "white leg." It is also said to aid the return of the womb to its normal size.

They claim that by the exercise of the abdominal muscles constipation is much less frequent, and finally they absolutely deny that it is a factor in producing displacements of the womb either backwards or downwards, and their statistics go to show that certainly they have no larger percentage of displacements in the cases which get up early than in those which are kept in bed for the longer period. The public have always been told that getting up early was the cause of displacements, of a return of bleeding, of the womb not coming back to its proper size, and it has even been blamed, by the public, for the occurrence of "white leg." In fact, if a woman who got up before the tenth day had anything wrong with her, it was always attributed to the doctor allowing her to get up too soon.

The patients who are allowed up early are warned against two things. They must not attempt to do very much, and particularly must they avoid for some six weeks or so the lifting of any heavy weights or the straining up for anything which is beyond reach.

The disadvantage of the system is that it is only applicable in hospital and among such people as can afford a monthly nurse. A working woman is no sooner up than she begins to work, whatever one may say to her, and in this lies the danger. Besides, many look forward to the rest in bed, and feel aggrieved at having the reward of their labour denied them.

I have seen a considerable number of cases now who have been allowed up on the third or fourth day both in hospital and in private practice, and there is certainly no comparison as regards strength and physical well-being between them and those who are kept in bed for the longer period. Women who have experienced both methods are all strongly in favour of the new way, and the difficulty now is to prevent them doing too much. One point which appeals strongly to all women is the fact that they usually regain their former figure more rapidly and perfectly in this way than under the old régime. For the past three years all my patients have been allowed up on the third day, unless there was some definite reason, such as severe hæmorrhage or heart disease, &c., which necessitated their staying in bed, and I have yet to see any harm arise out of it. I am convinced that it is only reasonable and logical, with the reservations mentioned, to pursue this course. If the mother would rather lie in bed I would not counsel bringing pressure to bear to get her up, but after the facts have been clearly explained to her, I think she should be allowed to act for herself in this matter.

There are various complications which occur during convalescence which must be shortly discussed. They are none of them common but they are very important, and they are mentioned here that patients may know and not neglect the symptoms.

The chief one is child-bed or puerperal fever. Formerly it was a perfect scourge wherever many puerperal women were gathered together, as in hospitals, since it spread from one to another like wild-fire. Now there is nothing like that, but still it is the cause of half the deaths which occur from pregnancy and labour, and this death-rate, taking the country as a whole, has not been reduced during the last thirty years.

It must be remembered that bad surroundings, bad drainage, and general uncleanliness are active factors in its production. In some cases the germs which may give rise to it are actually present in the genital passages before labour starts. I have seen puerperal fever in more than one case where the child was born before either doctor or nurse arrived, and the mother was not interfered with in any way.

It is caused by the germs which give rise to blood-poisoning elsewhere, with, in addition, as referred to before, scarlet fever, diphtheria, typhoid, pneumonia, and the organism which is always present in the bowel. It is much more common where the woman has had a severe hæmorrhage or has a piece of the after-birth or a clot retained in the womb.

It frequently appears on the third day, but may be later. It affects the woman very powerfully, often starting with a shiver, and causes a rise in the temperature and pulse rate. Headache, loss of sleep, and lack of appetite are prominent symptoms. Pain may or may not be present. If seen in time the doctor can usually combat the disease successfully, especially now with the aid of antiseptics; but it is a fruitful source of invalidism later on, and means a marked delay in the convalescence of the mother.

Another distressing complication of this time is "white leg," which is due to an inflammation of the veins of the leg frequently by a spread from the veins of the womb. It comes on, as a rule, late in the convalescent period, but the onset may be at any time from the fifth to the twenty-first day. It makes its appearance with a rise of temperature and pulse, accompanied by a sharp pain in the calf or thigh, and the patient feels generally out of sorts. The leg begins to swell, and as it swells the pain gets less. It becomes tense, white, and glazed, and feels very heavy and dead to the patient. There are often red lines along the course of the affected vein. The left leg is more often affected, but both are subject to it.

This is a troublesome condition, both because it has its dangers and because it has such a slow course. It may last any time up to two months or longer, and even then, though the leg may be back to its proper size whilst the patient is in bed, it usually swells again when she gets up. Until the doctor comes the leg should be raised on a pillow and kept quite motionless. The bed-clothes should be raised off it to avoid any pressure, and the limb may be surrounded by hot boracic poultices, on which some laudanum has been sprinkled to deaden the pain. Some cotton-wool bandaged loosely on the top completes all that can be done meantime.

A fairly common occurrence during this period is what is popularly known as a "gathered breast." Much may be done to avoid it by the precautions suggested in the previous pages. It is caused by germs which obtain entrance through cracks in, or down the ducts of, the nipples. It begins by severe pain in the breast, with a rise in temperature and pulse, and frequently headache. In the breast a small, hard, tender lump can be felt. If it goes on to an abscess the skin over it turns red, and eventually the gathering bursts. Before this occurs a large part of the breast has become affected and is destroyed by the abscess. If seen early an abscess can often be avoided, or at least limited in extent. Nursing is stopped, and the milk drawn off by a breast pump. A purge is given, and the breast is covered by a hot boracic fomentation. Should it go on to an abscess, this has to be opened by the doctor as soon as he is assured of its presence.

There is frequently trouble with the bladder after the confinement. It may be either that the woman cannot pass water, or it comes away from her involuntarily. In the former case this is frequently due to a nervous cause, from tears or bruises which have occurred during the labour. Every means should be employed to get the woman to pass water for herself, even to letting her sit up, but if all fail it must be drawn off by the doctor or nurse. When the urine is coming away in spite of the patient, it may be merely the overflow from a full bladder, or it may be due to a passing paralysis of the bladder neck. Both these pass off soon under appropriate treatment. More severe is the case where it is due to a tear into the bladder from the vagina, and if it is at all extensive, an operation will be necessary some months after the delivery.

The last complication I shall refer to is where the womb does not come back to its proper size, but remains permanently large. Of the complications during convalescence it is a common condition, and seems to follow cases where the womb has been over-distended, as in twins. Non-nursing women suffer more frequently from it than those who nurse their children. The presence of inflammation also causes it. Whatever may be the cause, the condition shows itself by the lochia remaining red too long and being rather profuse. The womb is bigger than it should be, and is frequently displaced backwards. The later effects are serious, pain, profuse periods, and white discharge being among the least of them. If treated at the time it is fairly easily cured, but if not a small operation six months later puts things to rights.

Before leaving the subject of the mother I would like to draw attention to the fact that pregnancy and labour are natural conditions; but it must be remembered that though this is so they set up a state in the woman which is on the borderland of disease, and the boundary line is easily passed, so that all possible precautions should be taken to keep the mother well and healthy.

THE NEWLY-BORN CHILD

Unless there is some very definite reason for the mother not to nurse—some condition which nursing would aggravate—every woman should suckle her baby. It is of the greatest value to the child, and it aids the mother's recovery from the strain of her confinement. There is some curious nervous connection between the breasts and the womb, and the irritation of the breasts, set up by nursing, induces contractions of the womb, and thus helps it to return more quickly and thoroughly to its proper size. Mothers who do not nurse are apt to have the womb bigger than it should be for a considerable period after their confinement, with the result that there is a much greater chance of displacement of it either backwards or downwards.

This alone is sufficient reason for advising every mother to nurse her baby, even if it be for only the first few months. If the breasts are taken care of and emptied regularly by nursing, they should occasion no trouble; they are being used as nature intended they should be used, and nature makes no mistakes.

For the baby, nursing by its mother is of incalculable importance. It is receiving the ideal food for its digestion and nourishment, and no other food—good though some substitutes may be—can approach in character the mother's milk. The child will thrive better, gain more weight, and be better tempered than under any artificial diet. The child gains a great advantage in the early days in some obscure way. The mother's milk at that time seems to supply to the child's blood certain substances which enable it to resist disease in a way that a child artificially fed from the beginning cannot hope to do.

Another enormous advantage to the child is that it is receiving unaltered milk which is absolutely free from any kind of germ that may produce disease, and it is exceedingly difficult to be sure that cow's milk—which is the usual substitute for the mother's—is not contaminated in this way. When one considers that the ordinary milk purchased from a dairy contains roughly 350,000,000 germs to the teaspoonful, the advantage to the child of the mother's nursing can be readily understood. Another advantage to the child is the fact that if a mother nurses her baby she generally takes a much greater interest in it, and therefore is less likely to delegate the entire care of it to an outsider, who cannot possibly have its well-being so much at heart.

Though the milk proper does not come to the breasts till the third day, there is present in them a fluid which is a form of milk and has special actions on the child; it is called "colostrum." It possesses the peculiar property already referred to, and in addition it has a definite purgative action on the child, owing to the large fat globules which are its striking characteristic. It clears out from the child's bowels the bile-stained material that is in them at birth.

Thus the child should be put to the breast about eight or ten hours after birth, and two or three times a day or even oftener thereafter till the milk comes and nursing proper begins. This stimulates the breasts to secrete, and it enables the child to get a good grip of the nipples and pull them well out, whilst the breasts, being comparatively empty, are still soft. When the child is nursing it should lie on its side with the mother also lying, leaning a little forward and supporting it along her arm. When the mother is out of bed she should always sit quite upright while the baby is having its meal. It should have about five minutes at each breast or ten minutes at one, the other breast being used at the next feed. This may not be quite sufficient for some children but it is ample for most.

It is most important to educate the child into regular habits in its feeding. It should never be allowed to go to sleep whilst suckling, and the mother must understand that it is a great mistake to give the baby the breast every time it cries. The crying is more often due to the indigestion of over-feeding than hunger through under-feeding; if it be the former the child is soothed for the moment, but the condition is really aggravated, and there will be more difficulty in curing it. It is a common practice, one to be condemned, to give the child frequent bottles of water and sugar during the first three days before the milk comes. As one doctor has put it, "If Nature intended the child to have this form of nourishment, the mother would have been provided with a water-tap." Occasionally, if the milk does not come freely on the third day, the baby may be given an odd "bottle" consisting of a tablespoonful of milk with two tablespoonfuls of water and a pinch of sugar.

Once the milk-flow is established the child should be fed regularly every two hours during the day between the hours of, say, six in the morning and twelve at night. Whatever hours may be chosen for starting and finishing, one definite rule should be observed, that of a clear interval of six hours at night. At first the child is apt to cry during the long interval, but in a week's time it will be quite accustomed to it, and will sleep the whole time. It is important to observe this rule, both for the sake of the mother and the child. It gives the mother a proper period of uninterrupted rest, and it allows the infant's stomach to become properly empty for once in the day.

If necessary the child should be waked up from its sleep, but as a rule it wakes shortly before, and usually lies quiet till feeding-time arrives. This régime should be continued during the first month, and after that the time at the breast should be increased, and the interval between feeds should be lengthened till, at the ninth month after birth, the baby should be weaned. Towards the end of the nursing period, about every four hours is often enough. Before that time feeding by breast alone may not be quite enough, and one should then add an appropriate bottle to help the natural feeding.

It is also very important for mother and child that nursing should not be continued too long, as the milk begins to get poor in quality, though keeping up in quantity. The child naturally suffers and becomes flabby, soft, and liable to rickets, whilst the mother gets run down and anæmic, and frequently suffers from severe headaches, palpitation, and indigestion. This is comparatively commonly seen amongst the poorer classes, owing to the impression that they cannot become pregnant again whilst nursing.

Every now and again with the establishment of the milk in the breasts, especially if it comes on with extreme suddenness and in great quantity, they may become very sore, and so react on the mother's system as to cause a certain amount of lassitude and headache. At the same time the temperature may rise a degree or two. This speedily passes off, and rarely extends over the first day of nursing proper.

After each feed, and indeed before as well, the nipples should be washed with some mild antiseptic, of which boracic acid is the best, so as to avoid germs gaining an entrance into any crack which may arise. If the breasts have been attended to as recommended in a previous chapter, there is not so much chance of those cracks occurring, but if not the nipples are very apt to turn sore and abraded during the first week of nursing, as the child both chews and sucks in getting the milk through the nipple. The cracks are extremely painful to the mother, and are, of course, an open gateway for the entrance of germs to the breast. They may be either at the extremity of the nipple, and are then more in the nature of an abrasion, or they may be where the nipple joins the breast and are then usually fissures.

The latter are much the most severe, and difficult to cure. They should be carefully attended to, or they may be the real cause of an acute inflammation which may end in an abscess or "gathered breast." Should such cracks occur, the best treatment is to avoid irritating them, by making the child nurse through a nipple-shield. This prevents any re-opening of the cracks by the suction of the child's mouth. Between feeds the nipples should be covered with a boracic fomentation, or better still the cracks may be painted with Friar's balsam or tannic acid applied as a powder. This is painful for the moment, but soon passes off and the cracks speedily heal. The nipple-shield should be kept clean in the intervals between use by washing thoroughly each time after the feed, and then put in a cup filled with boracic lotion.

The child's mouth should be kept as clean as possible by wiping it out after each feed with a piece of clean rag or cotton-wool dipped in mild boracic lotion. If this is not attended to, some milk is left between the gums and the teeth, where it ferments and a painful condition called "thrush" may be set up.

Sometimes the mother is compelled to abandon all idea of nursing her baby owing to some disease or deficiency on her own part, or because of something wrong with the child.

Should the mother become acutely ill with any of the fevers, it is obviously imperative for her to stop nursing at once. Should she be suffering from any wasting disease such as cancer, the double drain on her system hastens the course of the malady. But the commonest contra-indication, in the way of disease, to a mother nursing is consumption. It is not that the mother infects the child through the milk, unless she actually has the organism in her breast, but the strain on her system, already weakened by the disease, lowers her vitality to such a degree that the organism of tuberculosis already present in her system finds her an easy prey. Where formerly the disease had been quiescent it now makes rapid progress, and many mothers have become the victims of galloping consumption as the result of nursing the baby, when by not nursing their lives might have been saved, or at least prolonged.

Should the mother become pregnant again during the period of suckling, the baby must at once be weaned, owing to the double strain on her strength, the same reason holding good for weaning if the "monthly periods" reappear. During nursing they should not come on, but if they do they indicate that nursing should be stopped. It used to be thought that their return had a bad effect in the way of souring the milk, but in all probability the only result is a deterioration in its quality owing to the loss of blood from the mother.

In a few cases the mother may have no milk from the very beginning and obviously cannot nurse, whilst in many cases the nipples may be so indrawn that the child cannot get hold of them. By using a nipple-shield nursing may be carried on, and the suction may draw the nipples out if the condition is not too extreme. It is a good plan, where the nipples are at all drawn in, for the mother during the last three months of her pregnancy to pull them out gently as far as possible, at least once a day, whilst the breasts are still soft. If she cannot get hold of them I have seen good results from suction by means of an ordinary churchwarden clay pipe. The mother can do this for herself quite easily.

If the mother is unlucky enough to contract a "gathered breast," the child is, of course, at once weaned.

On the part of the child the principal indications for artificial feeding are such conditions as hare-lip and cleft palate, where it cannot exert any suction. Or if the child begins to lose weight, becomes thinner and more fretful and never seems to leave the breast satisfied, it has to be fed artificially; this is due to the poor condition of the mother's milk, but weaning may prove unnecessary, as much may be done in such cases by improving the mother's diet and perhaps substituting an occasional bottle for the breast feed.

If the mother is not going to nurse her baby for one of the various reasons mentioned, steps must be taken to limit the secretion in the breasts as soon as possible. This is usually done by covering the breasts with cotton-wool and applying firmly a broad domet bandage so as to exert a good deal of pressure on them. At the same time the diet is limited as far as possible to dry foods, and only the irreducible minimum of fluid allowed. After the second day a saline purge, such as "salts" or a Seidlitz powder, is given every morning, and this still further depletes the body of fluid and helps to dry up the breasts.

These measures are frequently all that is necessary, but often the milk comes in spite of them in sufficient amount to distend the breasts and make them very painful. It has hitherto been usual in such cases either to exhaust the breasts with a "breast-pump" or massage the milk from the breasts by rubbing them towards the nipples. The latter method can be better carried out by the mother herself than by anyone else. A little oil is put on the breast and it is rubbed firmly but not so hard as to give any pain, the milk being thus gradually expressed; the mother has plenty of time at her disposal, and she limits the pressure applied to the amount of discomfort she can comfortably endure. If those means are not entirely successful, it is a common practice to apply a belladonna plaster. This should be avoided if possible, as it is most uncomfortable, and one cannot see the condition of the breast underneath it. It is also unpleasant to take off. It is best removed by means of ether, though turpentine can also be used, but is much more painful in its application. Of recent years some doctors have taken no further means to stop the milk than purging and limiting the quantity of fluid drunk. The breasts are so heavy that they are supported, and if they become hard and painful the doctor has means at his disposal which can relieve the discomfort. The breast-pump and massage are condemned as merely encouraging the breasts to go on secreting more milk. Certainly in a few cases in which I have tried this plan it has been a complete success, and no inflammation has occurred. For perhaps two days the breasts were rather painful, but after that there was no further discomfort and the milk disappeared very speedily. A warm boracic fomentation is an excellent application if the breasts are hard and knotty. It seems to soothe the mother considerably.

Whilst nursing, the mother has to take considerable care of her general health, since upon this depends the quality of the milk, and consequently the nourishment of the child. The quantity of milk secreted depends to a certain degree on the amount of fluid taken. For that reason the mother should have a diet rich in fluids, and of these ordinary cow's milk is at once the most nutritious and most easily digested. It used to be thought that various alcoholic liquids were good for stimulating the flow of milk, but it is probable that they act only because they are fluid. Stout enjoys the greatest reputation in this way, and formerly was regarded as almost a necessity. We know now that this is not the case. It may help in those people who can digest it, as it is an excellent form of tonic; but not more than one bottle should be taken in the day.

The quality of the milk varies with a number of different factors: diet, exercise, sleep, and mental state.

The food taken by the nursing mother should be light and nourishing, and should contain the necessary elements of fat meats and starches. Two to three tumblers of milk will supply a good deal of the fat necessary, and for meat any of the white meats or fish is suitable. Red meat should be taken not oftener than alternate days. To supply the starchy material the usual amount of bread and potatoes should be sufficient, and in the summer time such vegetables as peas and beans will also help. Though it is difficult to prove, it is very probable, from the fretfulness and crying of the child after the mother has taken certain foods and medicine, that they pass in some way to the child by the milk.

Highly spiced foods, dietary accessories such as vinegar and sauces, the wines such as claret and burgundy, and even in some cases whisky may upset the child considerably. Fruits like strawberries, raspberries, cherries, plums, &c., may act in the same way, and such things as mushrooms and tomatoes. Certain aperients, such as cascara, have an unenviable reputation for giving the baby colic, and occasionally diarrhœa. Castor-oil has no tendency to do this, and that is why it is used so much for the nursing mother when she has any trouble in the way of constipation. The mother usually soon finds out any peculiarity the child has, and what articles of food disagree with it; and she can avoid them, as, even from a purely selfish point of view, it is preferable for her to deny herself some good thing to eat to soothing a fractious, crying infant.

Though there may be only a small quantity of milk secreted whilst the mother is confined to bed, one often notices a marked increase in the amount when she gets up and gets out to the open air.

It is a well-known fact that the state of the mother's mind has a marked effect upon the milk. Should she be the subject of a severe fright or any strong emotion, especially if a painful one, the milk is diminished in quantity and is apt to cause indigestion to the infant. For this reason placid, equal-tempered women make the best nurses for their children, whilst the babies of neurotic and highly-strung women are rarely well nourished. Women who know their shortcomings in this way should consciously keep themselves as calm as possible.

The child must have a bath twice daily from the beginning, and this should be of the same temperature as the bath after birth. It cannot stand the shock of anything cold, and even tepid water may be harmful. Care should be taken until the cord separates merely to sponge the child, as the cord must not be allowed to become moist. After the cord has dropped off, the child should be immersed completely. Most babies thoroughly enjoy their bath from the beginning, and all quickly get to like it, and miss it if they do not get it regularly.

As the bowels and bladder empty themselves involuntarily during babyhood, the diapers must be changed frequently. The average baby's bowels move three or four times a day, so attention must be carefully paid to this point, and it is better always to see to the diaper before each feed, and if necessary change it. Unless this is done the moisture in contact with the child will set up an inflammation of the skin of the buttocks and thighs, which may not be so easily cured as caused. This is especially necessary in children with very tender skins. The other causes and the treatment of this condition will be referred to later. The motions after the first three days should be yellow in colour and of the consistency of custard, and should contain no white curd of undigested milk.

If it be summer time the baby may be taken out after four or five days, a sunny day being chosen for the first expedition, but in winter it is wiser to wait ten days or a fortnight, so that the child may become accustomed to varying degrees of heat and cold. It must of course be warmly clad and completely covered. The sunshine and fresh air have a tonic and soporific effect on it. It usually sleeps during the whole outing if held comfortably by the nurse, and invariably takes more food and puts on more weight if it can get out than if it is kept in the house by bad weather. Like all other young things, the sunshine has an enormously stimulating effect on the child, and the sunniest part of the house is the best for it.

To refer shortly to the artificial feeding of the child, if for some reason the mother is not going to nurse it herself, it is easily understood that the food for it must be that which approximates most nearly to the mother's milk. The nearest approach to that is the milk of some other woman; "wet-nursing," as this is called, is but rarely made use of in this country, but is carried out extensively abroad with excellent results. The various points about getting a suitable wet-nurse are these: the nurse's own child should be very nearly the same age as the baby she is going to nurse; her own child should be gaining in weight, which indicates that her milk has sufficient nutritive value; there must be no evidence of any disease in either the nurse or her child, and of course she must also be clean and of morals above suspicion. On the other hand, there must be no suspicion of any hereditary contagious disease in the child she is going to take charge of. If this method of nursing the child prove repugnant to the mother, as it so often does, or be impossible on account of the expense, one must fall back on feeding either by an artificial food or by diluted cow's milk, the latter method being usually preferable.

The main difference between human milk and cow's milk lies in the amount and consistency of the curd which forms in the child's stomach. The less the curd and the more flocculent it is, the easier will it be digested. Cow's milk produces a heavy dense curd, and much less whey—the latter is very easily absorbed—than human milk, therefore the former must be diluted with water till we get the mixture to the proper pitch as far as the curd is concerned. In doing this the fat in the milk is so diluted that there is not sufficient for the child's needs, as fat is a most efficient factor in keeping up the child's body heat. To make up for this we must, therefore, add fat in some way, and cream is the most convenient way of doing this. At the same time the sugar which is present in milk is diminished in quantity to too great an extent, and this also must be supplied. Sugar of milk is, of course, the best thing to add, but ordinary sugar serves the purpose quite well. All these different constituents are absolutely necessary if the child is to thrive properly, and not become either anæmic and wasted, or soft and flabby. Another constituent which is diminished too much by the dilution is common salt. This is very easily supplied. Finally cow's milk is acid when obtained from a dairy, whilst human milk, as the child gets it straight from the mother's breast, is not, therefore many people overcome this acidity by adding a tiny pinch of baking soda. We have thus all the requisites for making up the bottle.

Next as to quantities; each feed should be of an amount equivalent to what the child would get at the breast, and that is equal to the capacity of its stomach, so each feed at the beginning should amount to not more than an ounce, which equals two tablespoonsful. The mixture should be given every two hours from 6 A.M. to 12 P.M. as in natural feeding. To make up a bottle for a newly-born baby, therefore, we would use two teaspoonsful of milk, five teaspoonsful of water, a teaspoonful of thin cream, a saltspoonful of sugar, and a tiny pinch each of salt and baking soda. Instead of ordinary water many doctors recommend barley water or oatmeal water as being more likely to keep the infant's bowels in proper order, owing to the greater constipating effect of cow's milk. Should there be diarrhœa, lime water may be used, as it has a binding effect, and also renders the curd lighter, but it should not be employed as a routine measure.

In this country, where there is a greater amount of bowel trouble than any other, people are either careless in, or have a prejudice against, sterilising the milk, and practically all writers blame this fact as the cause of the mischief. Though there is a sterilised milk on the market called Buddised milk, the commonest way to sterilise it is by heat. Boiling for ten minutes, of course, destroys all organisms, but it alters the milk in various ways so as to destroy to a certain extent its nourishing qualities. For this reason many people prefer to heat the milk to a point below boiling, and keep it at this for a longer period.

This is usually effected among patients who can afford it by means of some steriliser such as the Soxhlet. It consists of a kettle and a rack to hold ten bottles. The kettle is filled with cold water to the level of the milk in the bottles, and the whole kept at the boiling-point of the water for ten to twenty minutes. The mouth of each bottle is specially ground quite flat so that a rubber disc fits on and lies absolutely in contact with it, and on the top of this is a loose metal cap. After boiling, the rack with the bottles is removed from the kettle and cooled as rapidly as possible, so that the steam in the bottles is condensed and exerts a suction on the rubber discs, fixing them firmly, and so seals the bottle from outside contamination. One thus sterilises the whole day's feeds at once. As needed the bottles are taken out and warmed to the proper heat for feeding, and the rubber disc is taken off and a teat fitted directly over the mouth of the bottle.

For people who cannot afford this the best thing to do is to boil the milk, but be sure it is boiling, and not merely risen in the pan. It must be kept boiling for from five to ten minutes, which is no easy job, as anyone who has tried it knows. Have a jug ready scalded, and pour the boiled milk into this; cover it with some layers of clean muslin or linen, and put it into the coolest possible place in the house.

Another method, which does not bring the milk to the boil, is to have a double pan, the lower one to contain water, and the upper one, which fits into it, for the milk. The water is brought to the boil and then the whole thing is covered by a "cosy" for half to three-quarters of an hour, and this pretty well sterilises the milk. This process is known as pasteurising milk, but it is not so satisfactory as complete sterilisation. In such cases milk should be obtained fresh twice a day and sterilised or pasteurised at once.

The proper bottle to use is either a bottle of the boat-shape type or one such as is sold with the Soxhlet steriliser. In both there is a mouth wide enough to admit a bottle brush to clean it after use. In both there are no angles inside, but the bottle is properly curved, so that any milk remaining after the feed is over is easily got at by the brush and removed. The Soxhlet type is least affected by heat and can stand upright in a pan, so is preferable to the other. On the other hand the boat-shape bottle, with its two apertures, can be readily cleaned out by a flow of water through it. Points which absolutely condemn a bottle are screw fittings and sharp angles inside, and any bottle which has rubber tubing as part of its equipment should not be allowed in any house.

The teat should fit directly over the mouth of the bottle, and should be sufficiently soft to allow of its being turned inside out for cleansing purposes. There is either a simple hole or the three-spoke opening in the teat known as a "leech bite." The latter usually allows the milk to flow through too rapidly and easily, and hurries the child's feeding unduly, besides giving the child no exercise for its jaws and cheeks, which is an important point. A child sleeps soon after a feed, largely because it is tired through its efforts at sucking. After each feed the bottle should never be allowed to dry, but must at once be cleaned out with a brush and hot water and soda, or it may even be boiled. It is then set aside in some boiled water till it is again required. The teat should be turned inside out and well cleansed with warm water to which a little boracic acid has been added, and then put aside in some clean boiled water which has been allowed to cool.

By such means we can ensure the child's having thoroughly clean milk at each meal, and so avoid the stomach troubles so common in bottle-fed babies, especially during the summer months, when the heat greatly encourages the growth of organisms in the milk.

Some years ago the late Professor Budin of Paris introduced the method of feeding children from birth with undiluted cow's milk, and he got most satisfactory results. I know of only two children who have been fed in this way, and I am told that they are both remarkably healthy and fit in every way. Budin's rules, as mentioned in Dr. J. S. Fowler's book on *Infant Feeding*, are as follows:

1. The method is only to be used in children free from stomach trouble.
2. In premature or very small children the milk should be diluted for the first fortnight.
3. Milk must be sterilised for forty minutes.
4. Feeds should be small. (This is most important.)
5. The quantity given must be regulated by the weight of the child as ascertained at weekly intervals.

One usually starts with feeds of two tablespoonsful every two hours. If the child does not increase in weight, the amount should be augmented by an extra teaspoonful at each feed. The feed must be given very slowly, and this is said to be a most important point for the success of the method.

Children who suffer from cleft palate and hare lip cannot possibly obtain nourishment either from the breast or the bottle, and in them the only method available is to spoon-feed them. The milk is prepared and the mixture made up the same as for a bottle, and it is then poured slowly into the child's mouth by means of a teaspoon. It is a troublesome and slow method of feeding, but it is the only one that can be adopted in such cases, and if care is taken the child should thrive nearly as well as the bottle-fed infant.

DEFORMITIES AND DISEASES OF THE NEWLY-BORN CHILD

After the child has been bathed, the nurse should examine it with great care, to see if there are any deformities or deficiencies. If this precaution be taken, the child may be saved days of discomfort and sometimes even its life preserved. The penis should be looked at, if the baby is a boy, to see that there is a sufficient aperture for the child to pass water easily. If there is not, the baby strains and cries whenever it passes water, with the result that it is peevish and fretful, and because of the straining is apt to develop a rupture, or hernia. The doctor must be told of it at once, so that the child may be circumcised. I do not know that the Jewish custom of universal circumcision is not one to be adopted. It has many advantages, and I fail to see any disadvantages.

The opening of the bowel must always be examined, as, if there is any obstruction there, it will prove fatal to the child unless speedily attended to. It is not sufficient merely to inspect the buttocks, as the obstruction when it occurs is often situated an inch or so inside the bowel, therefore the nurse should pass either a thermometer or her little finger, well anointed with vaseline, into the bowel to make certain. In the event of there being any obstruction the child naturally can pass nothing, and the condition is noticed after the first twenty-four hours, as the diapers are unsoiled. When the cause is merely a membrane across the orifice of the bowel it is cured by an easy operation, but if the bowel is deficient a short distance inside, the operation is more severe and must be performed at once, owing to the danger to the child's life. In addition to there being no movement of the bowels, vomiting soon sets in, and this is frequently the first thing that draws attention to the child's condition. The condition is rendered worse by the teaspoonful of castor-oil which is given to the baby at the end of the first twenty-four hours. The obstruction prevents its having any effect in the natural way, and it causes the vomiting and griping to be much worse.

If the child's bowels have not moved within thirty-six hours from birth, the doctor must be notified in case the obstruction is too high up to be discovered by the nurse. The higher up it is the sooner the vomiting sets in, and the more likely it is to be fatal. If the condition be overlooked for any length of time, the child is so exhausted that it dies under the shock of the operation.

The spot where the cord joins the body should be inspected, as there is sometimes a protrusion of the bowel in that region. It is most noticeable after the cord has dropped off, as a small swelling protruding under the skin at the navel, and it is rendered more prominent by the child's crying or straining in any way. It can by gentle pressure be made to disappear as the bowel is returned to the abdomen. The cause is the weakness of the stomach wall at this point, and the space there is between the muscles.

This condition of rupture or hernia can usually be cured without operation by means of long-continued pressure, which prevents the bowel from leaving the abdominal cavity. The best way of applying this pressure at first is to wrap up a penny in a piece of boracic lint and cover the opening with it; on the top of this a little cotton-wool is put, and the binder is applied tightly enough to prevent the bowel protruding at all. Later, if it still persists, a belt with a pad can be obtained, which can be laced up to give enough pressure, and this should never be taken off except when the child is being bathed. These measures are usually successful, and it is only rarely that operation is necessary for this condition.

Another place where a rupture is apt to make its appearance is in the groin. There it is not so easily noticed, as the bowel makes its way down a canal in the abdominal wall along with the cord which goes to the testicle, and it does not protrude straight out as in the other variety at the navel. It causes a fullness at one or other side of the penis, and increases in size if the child cries or strains in any way. As in the case of the navel, the bowel can as a rule, by careful and properly directed pressure, be returned to the inside of the abdomen, but it comes down again as soon as the pressure is removed. This variety is much more likely to become what is known scientifically as "strangulated," and cause obstruction of the bowels. It is hardly ever seen in female children, since in them there is no descent of any organ from the abdomen as there is in male children.

It is treated on similar lines to the other, by pressure. This is best managed by a truss which has a pad to so press on the canal through which the rupture comes as to obliterate it. It is difficult to prevent this pressure irritating the tender skin of an infant, especially as the parts become wet from the diaper. For this reason the truss is usually covered with india-rubber to preserve it, and every time the diaper is changed the truss is removed, and the part on which the pad rests is washed and carefully dried. It is then well dusted with powder before reapplying the truss. Washing with a little weak methylated spirit may help to harden up the skin and prevent irritation. Owing to the growth of the child the truss has to be altered every six months or so. It is preferable, as a rule, to have the child operated on if the truss does not effect a cure within a reasonable time.

The child's feet should be examined to see if there is any suspicion of club foot. This condition can be helped a great deal if noticed at birth. In it the foot is usually turned so that the sole looks inwards, the inner border of the foot upwards, and the heel is very often pulled up as well. The whole foot seems shorter than it should be. To improve it the nurse should so move the foot as to return it to its proper position, and do away with the deformity. This should be done three or four times a day, and at the same time the legs should be rubbed with a little oil, especially the muscles on the inner side and calf. Between times the foot should be kept as nearly as possible in proper position by means of a bandage. Later, splints will be used if necessary, but a great deal can be done by the measures mentioned, if carried out from birth.

Not nearly so common is the type where the sole of the foot looks outwards and the outer border upwards. It is treated in the same way as the other, but the massage is directed to the outer and front muscles of the leg in this case.

There are various head conditions noticeable at birth. Practically every child born in the usual way has a distinct swelling of its scalp. This is due to the part of the head which leads not being supported, with the result that there is an exudation from the blood-vessels of fluid which distends the scalp. It seems a nasty deformity but need give rise to no alarm, as it disappears within forty-eight hours. In very hard labours the pressure of the mother's pelvis on the child's head may be such as to cause the rupture of a blood-vessel under the covering of one of the bones of the skull, usually the side bones which meet in the middle line at the top. This is a much more serious condition. It can be distinguished from other swellings of the skull by the fact that it is usually on one or other of the bones, and the swelling is limited to it, as the bone covering is attached so firmly at the edges that the blood cannot spread beyond it. Thus the swelling is on one side and does not pass across the middle line on the top of the head, nor does it come down below the level of the top of the ear. It is soft at first, but becomes firmer, and later has a hard edge. It takes about a month or six weeks to disappear, but does so eventually, leaving no deformity behind. Its only danger is, that if there is any scratch over it it may become infected with germs, and be transformed into an abscess. Nothing can be done to hasten its removal, and it is best left severely alone.

A common condition is the one known as "mother's marks." These are due to a dilatation of the blood-vessels in the skin, hence the reddish or port-wine colour of them. They vary greatly in size, and may be so small as to be scarcely noticeable, or may cover half the face or a large area of the body. They are frequently hereditary, and there is no truth whatever in the idea that they are in any way due to anything which may have occurred to the mother whilst carrying the child. That is a widespread belief, and the mark was said to resemble some animal which had frightened the mother during the course of her pregnancy. They usually make their appearance a few days after birth, but sometimes the child is born with them. They may be anywhere on the body, but are generally on the face, and sometimes there are several of them. They are apt to get bigger as the baby gets older, and certainly very rarely show any tendency to disappear of themselves. Operative treatment is most unsatisfactory, as it entails removal of the skin, so that if the mark is of any size it means a scar, even more disfiguring than the original mark.

There are a few conditions which affect the newly-born child which it would be well briefly to refer to.

The first of these is still-birth. If the doctor or a properly qualified nurse is present at the birth, the child is resuscitated and no evil effects follow. Should neither be present, a few hints may be given as to what ought to be done by whoever is there. Still-birth is where the child is born with the heart beating but is making no attempt to breathe. It is usually blue in the face, and the cord is pulsating slowly and strongly. As soon as the head is born the mouth and nose should be wiped out to clear away any mucus. When the baby is entirely born it should be held upside down by the heels and smartly smacked. This both shakes down any mucus from the air passages into the throat and makes the child cry, which is the best indication that all is well with it.

If this fails, some cold water may be sprinkled on it, or the child may be immersed in a cold bath (for a moment only), and then put into a hot one. This may be repeated several times. Should this fail, some form of artificial respiration is necessary. The simplest method is to hold the child with its buttocks resting on the wrist of the nurse, and its legs hanging down on each side; its back and neck lie on the palm of the hand and fingers. The child is then turned over on to the other hand so as to lie on its stomach and chest, and the chest and back are then squeezed by the first hand. It is then returned to its original position, and the process repeated. This is done about twenty times a minute, so as to establish the proper breathing rhythm.

It is much more dangerous when the child is born very pale and corpse-like, with the cord pulsating quickly and feebly. In that case the child must be placed in a hot bath and a drop or two of whisky allowed to trickle down its throat after the mouth has been wiped out. Whilst in the bath the chest may be squeezed regularly as in artificial respiration, but on no account must any cold water be used, or it may, by shock, prove fatal to the child in its weakened condition.

Another disease of babyhood is inflammation of the eyes. Usually about the third day, if this disease is coming on, the eyes become reddened and the lids badly swollen. There is a free yellow discharge, and the lids are apt to stick together. If not attended to, it is a frequent cause of blindness, either partial or total. It can be prevented, as a rule, by merely wiping the eyes, as soon as the head is born, with a piece of clean rag dipped in boracic solution, as it is caused by infection from the mother's passages during birth. If it occurs, the doctor must be notified at once, owing to the great danger of blindness.

About 90 per cent. of children suffer from jaundice on the second or third day after birth. Nobody can say for certain what is the cause, and it really matters very little, as it gives rise to no distress in the child unless there is something serious behind it, which is very rarely the case. It does not require any treatment, and disappears of itself in a day or two.

The baby's skin is very active for some time just after birth, and there is frequently a similar activity in the breasts, with the result that they may swell and even have a little fluid in them about the third or fourth day. Should they be irritated then, they may become inflamed and even go on to a "gathering." This may be a very widespread condition and cause total destruction of the breast and skin around. It may even have graver results. It was predisposed to by the habit old midwives had of forcibly drawing out the nipples of a new-born child to, as they put it, break the nipple strings, an idea which was entirely erroneous, and frequently led to retracted nipples later, the condition it was meant to cure. If they swell up they should be treated by cleanliness, and a fomentation, and covered by cotton-wool applied to preserve them from injury. If they suppurate, the doctor's attention will be required.

The last condition we will refer to is that of sore buttocks. The cause of this is diarrhœa. Sometimes it is due to the mother's milk diaagreeing with the child; at other times, and more frequently, artificial food is the cause. The constant moisture of the diapers sets up an irritation of the skin, with the result that the buttocks and insides of the thighs become red and inflamed, and may even become ulcerated. The treatment should be directed to the exciting cause, with the addition of ointments or powders to soothe the skin. If the child is being artificially fed, lime water should be used to dilute the milk. In this way the diarrhœa may be checked. If the child is being breast fed, it may be taken off the breast and fed artificially for a day or two, whilst the mother has a dose of castor-oil, and her diet slightly altered to simpler foods. The diapers should be frequently changed, and the skin washed and carefully dried; it should then be freely dusted with boracic powder. A favourite application is a mixture of castor-oil and zinc ointment.

Again I would emphasize the fact that with the majority of babies receiving proper care, things do not, for the most part, go wrong, but the duty of mother and nurse is constant watchfulness. Morbid anxiety is to be condemned, but no harm can be done, and much may be prevented, by assiduous distrust of any abnormal symptoms. I would end this book on the note with which it started, the emphasis of the joy of motherhood.

The "burdens" of a large family often loom larger in the imagination of the unmarried critics than in the experience of the parents. The task of a good mother in any grade of life is no light one; it involves increasing watchfulness and tact. The mother is "tied" in a way which sometimes seems intolerable to others, but she alone knows the endless compensations which lighten the burden. It may sometimes involve great neglect of "social life" (though the wisest mothers will contrive recreation and companionship for themselves), but meanwhile the mother is performing the highest social service in the intelligent fulfilment of her duties.

For the children themselves the advantages of the large family over the smaller are obvious. The children are generally happier in themselves, and pleasanter to other people. The family becomes a real community, and its members receive the educative and disciplinary advantages which others must seek and find but imperfectly and painfully in school life.

Nor is the expense of bringing up a large family proportionately greater to that of maintaining one or two children. The first "confinement" is always the most expensive. For subsequent occasions many things are already in hand, and this is but illustrative. Moreover, the intelligent woman becomes more and more expert in the art of managing the home. The sneer of those who describe a large family as a "luxury" is in a sense true, but the luxury sweetens the sacrifice it involves.

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DIET AND DIETING

THE NUTRITIOUS PRINCIPLES ILLUSTRATED PRACTICALLY

Dietetics may be defined shortly as the science which treats of foods and feeding. It is to be noted that these words are employed in their most expansive sense to include all alimentary substances which can be or are customarily used by man for nourishing or aiding in the nutrition of his body. As the fundamental object of food is to build up and maintain the body in a condition capable of meeting the demands made upon it by daily life, our first duty will therefore be to obtain an accurate conception of the composition, from a chemical aspect, of the human body; and for the purpose we have in view this need not detain us very long.

This information can, of course, only be derived from analysis of the dead body, and hence we are compelled to surmise that the living material protoplasm of which it is composed is essentially the same substance, dead or alive.

The results of an investigation into the chemical structure of the human body may be stated in two different ways. In the one we may give a detailed account of the various elements of which it is composed, but as few of these exist in the free state this hardly advances our knowledge very materially. It is of some importance to know that the following are always found: carbon, hydrogen, nitrogen, oxygen, sulphur, phosphorus, sodium, potassium, calcium, magnesium, chlorine, iron, iodine, fluorine, silicon, and lithium, the last four being in very small proportions. The other method of stating the composition of the body is of infinitely greater value, because by the grouping of these elements into compounds we actually come face to face with the very substances which require to be built up or renewed by food. Thus we find that at least 70 per cent. of the body weight is composed of *water*, that the bulk of the remainder consists of *proteins* and *fats*, whilst only a very small quantity of *mineral matter* and still less of *carbohydrates* are able to be discovered.

The Alimentary Principles.—It will seem that these five substances are easily divisible into two classes: the *organic*, consisting of proteins, fats, and carbohydrates, and the *inorganic*, including water and mineral salts. The term usually applied to the whole group when referring to their presence in the body is that of the *proximate principles*, but as component parts of the food they are more generally known as the *alimentary principles*.

Before concentrating our attention more definitely on these words or making any attempt to give a definition of food, and in order to infuse a real live interest into what may very well become a somewhat dry subject, I think it will be judicious at this stage to give a short, succinct account of the recent controversy on the respective merits of white and brown bread. By this means we shall at once put ourselves in possession of some of the most prominent factors in the domain of dietetics, and at the same time rescue this little treatise from the accusation of being simply an epitome of a dry-as-dust scientific text-book.

What is Brown Bread?—There is not the slightest doubt that originally this term was used to signify bread which was made from stone-ground flour manufactured from the whole grain of wheat, the colour of which without compromise was distinctly and decidedly brown. It has been stated over and over again that the regular use of this bread would have prevented the decay of the teeth which is such a prominent feature amongst all classes to-day, and I am inclined to support this belief. But it is also true that the introduction of this bread was responsible in some measure for the very evil which it would have stayed had it been permitted, and this paradox is easily explicable.

It was soon found that wholemeal bread required a considerable amount of mastication—the sole reason for the existence of good teeth, because whenever an organ is well used it becomes healthy, and when it ceases to be used, Nature quickly removes it or causes it to atrophy. It is not, therefore, a question of an extra amount of mineral salts or indeed any other ingredient of the wholemeal which is of such outstanding value to the teeth. It is simply and solely because the introduction of bread made from it compelled a more thorough use of the teeth, and the pace which was set in the last half of the nineteenth century being far too fast to permit of the mastication of wholemeal bread, it was soon discarded as nasty and unfit to eat.

Prodigious efforts were made by bakers to perpetuate its use under the designation of brown bread, and substitutes containing a little malt, or simply white flour with an admixture of bran, obtained a certain vogue, and still persist to-day. These possessed the great advantages, from the public point of view, that they required much less mastication and were not nearly so liable to become dry and hard as wholemeal bread. They therefore rapidly became popular amongst those who considered it judicious to shun the use of white bread, under the mistaken conception that they were of equal dietetic value with bread made from stone-ground flour manufactured from the whole grain of wheat.

Standard Bread.—Thus it came about that bread possessing none of the advantages of wholemeal bread and distinctly inferior to ordinary white bread became substituted for the former in the popular favour, much to the detriment of the nation. Glimmerings of the truth were fitfully published, chiefly due to the efforts of the medical profession, but these were without any appreciable result until a crusade was undertaken by the daily papers, stimulated doubtless by the Bread Reform League. Under these influences the issue became very much confused, and all sorts of claims were made for a distant relative of wholemeal bread containing 80 per cent. of the whole-wheat berry, designated "Standard" bread. All the physical deterioration which is so rampant to-day was attributed to the use of white bread, which was described as a mere mass of bleached starch, lacking in the essential elements of nutrition and quite unfit for food.

Standard bread, on the contrary, was said to contain four times more mineral salts, which are so valuable in building up the bones and teeth and contributing generally to the strength of the body; a much larger proportion of protein, which is the basis of all life; a certain proportion of fat not to be found in white bread; and a small proportion of bran in a finely powdered condition, which, by acting as a mechanical stimulant to the intestine, regulated the bowels and overcame the tendency to constipation. In addition to this, being distinctly firmer and harder, it compelled more careful mastication, thus cleansing the teeth and leaving them in a more healthy condition, and incidentally improving the digestion by the only effective means at the disposal of the individual.

About the only disadvantage admitted to be found in this standard bread was its unfortunate colour, but this was minimised as much as possible, until its dull, dirty-white shade was merged into an almost golden-yellow. After such a magnificent advertisement one could hardly wonder that standard bread quickly established itself in public favour. What the medical profession could not compass in a glorious half-century of effort, crowded with schemes for the amelioration of the ills of suffering humanity, a halfpenny journal was able to accomplish in a few weeks of daily suggestive therapeutics.

Now whilst I have no desire to disparage the merits of standard bread, I have little hesitation in predicting that after a few months the public will again revert to the use of white bread. I am fortified in my conviction by the history of the past century, and whilst I look upon the present popularity of standard bread as a veritable triumph for the press, all experience goes to show that the working classes at least pin their faith entirely to the white variety.

The Merits of White Bread.—There must, of course, be a reason for this preference, and it quickly becomes apparent on a little study of the subject. Careful examination of a grain of wheat by cutting it into thin slices will reveal the fact that it consists of the following parts: (1) the germ from which the future plant will grow accounts for 1½ per cent. of the whole grain; (2) the kernel or endosperm intended as food for the germ and consisting of 85 per cent. of the grain; (3) the bran or protective covering, composed of hard woody fibre impregnated with mineral salts, constitutes the other 13½ per cent. of the grain. Each of these parts contain protein in varying quantities, the greatest amount in proportion to its size being in the germ, and the smallest amount in the innermost layer of the bran. The endosperm contains of course most of all, in the form of gluten—the sticky substance which makes the manufacture of bread possible—the small particles of which lie in a mass of starch grains. The only fat found in wheat resides in the germ, but it is almost negligible in quantity.

Although it is quite possible to utilise wheat in its entire state as a food by soaking it for a long time in water, then boiling it in milk and adding a little sugar, thus making frumenty, it is usual to *grind* or *mill* it into the state of flour. By the stone-grinding process the bran was discarded and the germ and endosperm ground together. The modern roller-mill, however, not only rejects the bran but also the germ, because of the fact that its oil is apt to become rancid, and its proteins slightly digest the starch, converting it into a soluble form called dextrin and also in a lesser degree into maltose or malt sugar. This, of course, darkens the colour, and hence militates against the popularity of the bread made from it. For this reason only 70 per cent. of the grain is utilised in the production of ordinary flour, and there are many grades of flour on the market, some wheats containing more gluten than others. The composition of flour indeed is a very variable matter, and as a certain proportion of gluten is necessary to make a good loaf, recourse has been had to blending different varieties of flour, and even adopting special processes to ensure a wholesome nutritious bread.

It can easily be seen that in the effort to secure a presentable white bread, much of the valuable part of the wheat must be sacrificed, especially the germ containing much protein and fat, and the bran containing protein and mineral salts, indispensable to the growth and building up of the body. "Hovis" flour is a special preparation designed to save the germ, which, after separation, is first cooked by superheated steam, thus rendering the proteins ineffective as agents for digesting the starch, and sterilising the fat, which does not thereafter tend to become rancid. It is subsequently ground and added to ordinary flour in the proportion of one part to three, thus constituting a most nutritious product.

Other processes endeavour to save the protein and mineral matter of the bran whilst discarding the indigestible cellulose, and others again, whilst using no selective method of preparation, utilise 80 per cent. of the ingredients of the whole-wheat berry. It is this last class from which the article called "Standard" bread is manufactured, the title indicating that it is always of the same composition, and that the best for purposes of repairing the body waste in the adult and building up the growing frame in the young.

Now in estimating the value of this commodity we must not overlook the fact that a "standard" flour is quite an anomaly, because it is not only impossible to lay down a standard composition for wheat, but it is even impossible to be sure that the various classes of flour made from one single sample of wheat contain a uniform quantity of mineral salts. A report issued by the Local Government Board on "The Nutritive Value of Flour and Bread" emphasises this statement, and asserts that there are commonly wider differences in protein content and energy value between the patent flours obtained from different wheats than between the "patent" flours of a given wheat and the corresponding wholemeal, so that a patent flour obtained from one variety of wheat may contain considerably more of protein and furnish more available energy than an entire wheat and wholemeal flour from another kind of wheat.

Standard bread can therefore never be uniform in composition, and may indeed be very inferior to white bread.

The average composition of wholemeal and white bread, according to Hutchison, is as follows:

Composition of Wholemeal and White Bread Compared

	White Bread.	*Wholemeal Bread.*
Water	40·0	45·0
Protein	6·5	6·3
Fat	1·0	1·2
Starch, sugar, and dextrin	51·2	44·8
Cellulose (indigestible)	0·3	1·5
Mineral matter	1·0	1·2

Atwater shows the following analysis:

	White Bread.	*Brown Bread.*	*Graham (Wholemeal Bread).*
Water	35·4	40·0	32·3
Protein	9·5	5·0	8·5
Mineral matter	1·1	1·9	1·5

These analyses compare very unfavourably with the composition of flour made from the wholemeal:

Water	12·1
Protein	12·9
Fat	1·9
Starch (carbohydrates)	70·3
Cellulose	1·6
Mineral matter	1·2

But it must be understood that a large proportion of water is added in the formation of bread, and—what is of vital importance—a great deal of the nutritious value is lost in the baking or cooking. Thus nearly all (71·2 per cent.) of the fats, 1·3 per cent. of the proteins, and 3·2 per cent. of the carbohydrates disappear in the process of baking.

It has been said that statistics can be made to prove anything, and it is certain that one must not place too great faith on an array of figures which represent the chemical composition of a dietetic substance. Chemical composition indeed is of very little real guidance in estimating the actual value to the body of any food apart from the vitally important items of digestion and absorbability. Now it would be quite impossible to trace a piece of bread through all its intricate wanderings in the body, including its incorporation into the actual substance of the body cells and its final rejection in simpler products by the skin, lungs, kidneys, and bowels, but it is easy to form a true conception of its value as a nutritious agency.

Digestion of Bread.—In ideal circumstances a fairly large proportion of a given quantity of bread is digested in the mouth. Starch or carbohydrate is quite incapable of absorption until it has been rendered soluble, and this is effected by the action of saliva, which converts it first into dextrin and subsequently into maltose. Pavlov demonstrated that the chewing of fresh moist bread produced no secretion of saliva worth mentioning, but dry bread caused the saliva to flow in large quantities. Stale bread, crust of bread, toast, zweiback (double-toasted bread), and plenty of biscuit compel fairly prolonged mastication with plenty of saliva, while soft bread is usually bolted with no production of digestive juice of any consequence.

On reaching the stomach this digestion of the starch by saliva still goes on until it has been neutralised by the outflow of gastric juice in from half to three-quarters of an hour, and then the protein is attacked by the pepsin and hydrochloric acid. Bread provokes a secretion of five times more pepsin than an equivalent quantity of milk, and four times more than meat, but a much smaller quantity of hydrochloric acid so as to interfere as little as possible with the alkaline saliva. Gastric juice is only able to digest proteins, and in about two hours and a half a slice of bread is ready to leave the stomach.

The various digestive fluids of the intestine soon complete the digestion of the starch and protein and the small quantity of fat contained in bread, and then absorption into the blood takes place. Up to this point there is practically no difference between white and wholemeal bread, but the superiority of the former now becomes apparent. It is easy to understand that no matter how well digested an article of diet may be, it is quite incapable of nourishing the body until it has been absorbed, and in this connection white bread is paramount, for only 3 per cent. of its carbohydrates, 20 per cent. of its proteins, 25 per cent. of its mineral matter, and 4½ per cent. of its total solids escape absorption—even when it is given alone. When mixed with other foods, for example milk, a very much larger proportion is utilised for the nutrition of the body. When we compare these really excellent results with wholemeal, we find that 6 per cent. of its carbohydrates, nearly 30 per cent. of its proteins, over 50 per cent. of its mineral matter, and 14 per cent. all told of its total solids are actually unabsorbed.

To a very large extent these inferior results are due to the presence of so much cellulose or indigestible woody fibre which prevents the digestive fluids from dissolving the nutrients present, but whether this is the sole reason or not, it is quite certain that, weight for weight, white bread is infinitely more nutritious than wholemeal bread or any far-away imitation of it. Standard bread, therefore, while containing a slightly larger proportion of nutritive ingredients, cannot be nearly so well absorbed as white bread, and its available nutritous power is decidedly less than that of the latter.

Not only is this the case, but the really valuable feature possessed by wholemeal bread, viz. its power to counteract the tendency to constipation, is practically absent from the standard bread, which makes a point of excluding most of the bran on the plea that it is innutritious.

In view of these facts, efforts have been made to manufacture bread containing a much larger proportion of digestible material, and the most successful attempt so far as I am aware is Malt-weat, made by Winter of Birmingham. Instead of the 47 per cent. of insoluble carbohydrates of white bread, it only contains 10 per cent., while in lieu of 6 per cent. of soluble carbohydrates it possesses no less than 53 per cent. in the form of maltose and dextrin, *i.e.* nearly nine times the quantity contained in white or standard bread. Its value is also enhanced by its small quantity of moisture—quite 10 per cent. less than any other bread on the market. Hardly less important, however, is its content of protein, which is not only at least 10 per cent. higher than in the best quality of white or standard bread, but is practically all capable of immediate absorption, as in large measure it is not surrounded by an insoluble covering of cellulose. It is therefore not only superior in nutritive power to any other bread, but much less energy is dissipated in digesting and absorbing it, so that its value to the human economy is unexcelled.

DEFINITION OF FOOD AND ITS FUNDAMENTAL PRINCIPLES

A careful consideration of the facts contained in the last section will quickly reveal in a concrete form many important principles of dietetics which we shall now proceed to elucidate. Needless to say, it will be impossible to treat these principles in the detailed manner of a text-book, but I hope to be able to give a great deal of valuable practical information which will stimulate my readers to pursue the study of the subject further.

Definition of Food.—I have no doubt most of my readers want to know first just what constitutes a food and in what manner it is supposed to nourish the body. The most comprehensive description of a food with which I am acquainted is this: Any substance which when introduced into the body is capable of repairing the waste of its tissues and so building it up and furnishing it with heat and energy.

In thinking over the various substances which would fulfil these functions, we naturally recur to those already mentioned as actually entering into the composition of the body, viz. proteins, fats, carbohydrates, mineral matters, and water. A most searching examination into all the varied diets of all the manifold races of mankind reveals the fact that, despite their enormous differences, each one can be resolved into these five substances, which are hence called the alimentary principles.

Irresponsible professors of dietetics amongst the laity do not hesitate to advance preposterous claims for the inclusion of other principles, such, for instance, as the possibility of inspiring nitrogen from the air and so adding it to the resources of the body, but there is not an atom of evidence in support of any theory which suggests any other than the above means of obtaining nourishment for the body. It is not necessary for more than one of these principles to be present to constitute the substance a food, *e.g.* sugar is a pure carbohydrate and butter is almost a pure fat, whilst white of egg is almost a pure protein. Usually, however, there is more than one present, and we have seen that bread contains all the alimentary principles in certain proportions.

Nature, the Great Food Alchemist.—Proteins, fats, and carbohydrates constitute the organic section of the alimentary principles, and are obtained, at least in the first instance, from the vegetable kingdom. Our bodies after death crumble into dust and mingle with the soil, thus supplying it with nitrates. The atmospheric air contains carbonic acid, likewise derived from the activities of living animals. Plants alone are able to utilise carbon and with the aid of water build it up into carbohydrates. These are eaten by animals, and after being used by them are excreted in the form of carbonic acid and water. Animals after their death therefore become the food of plants, and so it is only right and proper that they in their turn should become the food of animals. Plants again can extract nitrogen from the soil and, assisted by the carbon in the air, build up complex vegetable proteins, which being consumed by animals and broken down into simpler products again become the food of animals.

The power possessed by plants of building up complex organic compounds out of simpler chemical elements is the key to the claim made by vegetarians that plant foods alone are endowed with "vitality," whilst flesh foods are simply decaying devitalised tissue utterly useless for body-building purposes. Experience not only teaches that this argument is quite erroneous, but evidence is accumulating in favour of the existence in animals of a similar synthetic power.

The inorganic section consists of water and mineral salts, but practically the only one of the latter consumed as such is common salt (chloride of sodium), all the others being ingested in intimate association with the organic foods.

The organic nutrients are again divided into nitrogenous and non-nitrogenous, the proteins belonging to the former and fats and carbohydrates to the latter section.

Proteins.—(A.) Animal.—The proteins are the best-known representatives of the nitrogenous class, and are composed of carbon, hydrogen, and oxygen, with nitrogen and sulphur. The first three elements are likewise the component parts of the fats and carbohydrates, so that proteins combine in themselves to a certain extent the properties of both classes of nutrients, and can to a certain extent replace them. It is, however, impossible for the fats and carbohydrates to replace or be built up into proteins, of which the protoplasm of both the plant and the animal cell is mainly composed.

There are many varieties of proteins, most of them being insoluble in water, but some, like the albumins of blood serum, egg, and milk, being quite soluble. One part of egg white and two parts water thoroughly shaken together make albumin water, an excellent food to administer to babies and others suffering from diarrhœa. There are other proteins in blood and white of egg called globulins, which are only soluble in water with the aid of a neutral alkaline salt. Egg yolk again contains vitellin, whilst milk contains caseinogen, both of which are phospho-proteins. The flesh of most animals is composed of proteins, chiefly myosin, and these are associated with nucleo-proteins which on decomposition yield the notorious substance known as uric acid—in its way quite a harmless body if it only be expelled rapidly enough from the system. Being, however, rather insoluble, especially in acid fluids, it has a way of getting into positions where it is not wanted and thus creating trouble.

(B.) Vegetable.—So far I have only mentioned animal proteins, but there is an infinite variety of vegetable proteins—twenty or thirty different kinds at least being known—and these are not quite so acceptable to the human body as animal proteins, because the latter undoubtedly correspond more closely to the proteins of which our own tissues are composed. Not only is this the case, but the vegetable proteins are usually enclosed in an indigestible envelope of cellulose, just as we have seen in the case of the gluten of wheat in the wholemeal bread, and until this has been ruptured they are unable to be digested and absorbed into the blood. They are therefore in large measure expelled in the fæces quite unutilised, and Voit has shown that in this way as much as 42 per cent. of the nitrogen of the vegetarian's food is lost.

Proteins all agree in one particular, and that is, they undergo a curious transformation called coagulation in the presence of agents such as heat, alcohol, and astringents generally, like alum and tannin, and ferments such as rennet. The hardening of eggs, the clotting of blood, and the curdling of milk are familiar examples of this change.

Like all organic matter, proteins may be burned, and when this takes place in the air they are decomposed into carbonic acid gas, water, oxide of sulphur, and pure nitrogen, which passes off unchanged. A precisely similar process of oxidation—as it is called because oxygen is absorbed from the air—takes place in the body, but the various stages of decomposition are by no means so simple, another process termed hydrolysis being invoked to assist matters. Hence the proteins are not so thoroughly burned up as in the air, so that they leave cinders or ash, which is apt to accumulate in the body under certain circumstances. Urea is the best known of these residual products of the disintegration of proteins, and it is excreted in the urine, but there are many other much more complex and usually poisonous compounds which make their appearance in the lower bowel and are apt to be reabsorbed into the body and so set up a form of self-poisoning termed auto-intoxication.

Fats.—In common with the carbohydrates, fats are composed of carbon, hydrogen, and oxygen, but in contradistinction to them contain more carbon and less oxygen, for which reason a given quantity of fat on burning will produce 2¼ times as much heat. In the human body and bodies of animals they are found in large quantities in bone marrow, adipose tissue, and milk, whilst in plants they are most commonly found in seeds, *e.g.* nuts, linseed, &c. Body fat is a mixture of three fats, stearin, palmitin, and olein, and on account of the low temperature at which the last-named becomes solid, viz. 5° C. (41° F.), the contents of the fat cells of the adipose tissue are fluid during life. Fats and oils are identical in composition, only differing in their melting-points. Fats are insoluble in water, although their component parts, viz. fatty acids and glycerine, are soluble. Hence in the body during digestion they are split up into these substances and so absorbed. Milk contains varying proportions of fat—cow's milk 3½ to 4 per cent., while whale's milk contains as much as 43 per cent., and this is an interesting illustration of adaptation when one remembers the heat-producing powers of fat.

Carbohydrates.—These substances are usually defined as compounds of carbon, hydrogen, and oyygen, in which the last two elements are in the same proportion as in water, and in the main this is so. They are essentially vegetable products—starch, cellulose, cane sugar, grape sugar or glucose, fruit sugar (lævulose or fructose) being typical examples. Two are found in the animal body, viz. milk sugar or lactose and glycogen or animal starch, the latter being present in the liver, muscle, white-blood corpuscles and other tissues. The more common forms are divided into three classes—(1) the monosaccharoses: grape sugar (glucose), fruit sugar (lævulose), and galactose; (2) the disaccharoses: cane sugar (saccharose or sucrose), milk sugar, and malt sugar; (3) the polysaccharoses; starch, dextrin, glycogen, cellulose. It is interesting to note that before they can be utilised in the body as food they must each be converted into grape sugar.

Sugars are all easily soluble in water, and for household purposes are mainly derived from the sugar cane and the sugar beet, in about equal proportions. It is a great mistake to look upon sugar as simply a condiment, as although it is incapable of supporting life on account of its lack of nitrogen, it is a most important nutrient. It produces heat and energy in a much more economical and agreeable form than protein or fat. The food-fruits, apples, pears, grapes, bananas, owe their food value almost entirely to their content of sugar. The great value of sugar as an energy-producing food is now so well known that in the German army whilst on the march a daily ration of four ounces is issued to each man. It is equally useful as a nutrient in the case of children, and in the winter time when given to the limits of a child's digestive capacity its heat-producing power is calculated to save the expense of an extra garment. It is apt, however, to be indulged in to excess, and in this way may injure the child's appetite and digestion. It is stated to have no ill effects on the teeth, but this is rather doubtful, and in any case there is an enormous contrast between the beautiful molars of the sugar-cane-loving negro and the decaying stumps of the sweet-eating Briton.

Sugar can also be obtained from the sap of the maple tree and from corn and other starches. Molasses is a by-product obtained in the refining of sugar, and syrups are obtained from the evaporation of the saccharine juices of plants. Honey is composed of 60–75 per cent. of invert sugar (*i.e.* derived from natural sugars by inversion) and water, and shares with milk the distinction of being the only dietetic agencies originally intended for this purpose and no other. It is much more easily digested than sugar.

When yeast is allowed to grow in a solution of sugar, alcohol and carbonic acid are produced, and this alcoholic fermentation is well illustrated in the manufacture of beer.

Starch is found in practically all plants, and is composed of a number of overlapping layers separated by cellulose. It is specially abundant in potatoes and cereals. It is insoluble in cold water, but when treated with boiling water the little starch grains swell up and rupture the cellulose envelopes. When heated in the dry state it is converted into dextrin (the common gum used for postage stamps) and soluble carbohydrates. Dextrin is formed in this way in the crust of bread and wherever potatoes or other starchy foods are browned.

Cellulose is the groundwork or skeleton of plants within which the cells are enclosed. It has the same chemical composition as starch, but except in young and tender plants it is quite indigestible, and therefore prevents its nutrient contents from becoming available as food, unless by heat or otherwise the cellulose envelope is ruptured. Carbohydrates and fats are consumed by burning in the air or oxidation in the body, their end-products—when combustion is complete, as even in the body it usually is—being carbonic acid and water.

It is convenient to complete our review of the alimentary principles at this point, and for this purpose we make a short reference to the mineral matters and water.

Mineral Matter.—In a properly balanced dietary there is not the slightest necessity for the addition of any mineral salts to our diet, and except for the almost universal presence of the salt-cellar on our tables we might remain in complete ignorance of their existence. Nevertheless, they are quite indispensable to the vital activities of the body, and animals from whose diet they have been purposely excluded quickly succumb. It is even of greater interest to know that the addition of inorganic mineral salts in correct proportions to a diet which has been exhausted of them is not sufficient to enable it to impart nourishing properties to the body. Mineral salts in the food must therefore exist in some organised form or vital association, and their deprivation even in small quantities is frequently followed by disease. It is now known, for example, that the peculiar malady so prevalent in the East and known as beri-beri owes its inception to the use of polished rice as the staple article of diet, and the addition of the external coats which have been "polished" off the rice soon exterminates the disease. The lacking essential ingredient which is responsible for the outbreak of this disease is some organic compound of phosphorus, and it is worthy of being noted that while the addition of inorganic or even organic phosphates cannot stay the malady, substances like peas or beans, yeast, wheat bran, or rice meal, all of which contain this organic phosphorus in large proportions, at once cure the disease when present, or prevent its development.

On a mixed diet containing a fair quantity of animal food there is really no necessity to add any common salt at table, because animal food already contains an abundance of mineral matter. Nevertheless, most people consume more than half an ounce per day, and it is open to question whether in some cases it may not be extremely harmful to do so. In any case, those who are subject to catarrhal ailments of one kind or another, such as frequent colds in the head, would do well to keep their supplies of common salt within the most moderate limits. Despite this statement, there is no reason to believe that in the average case even a fairly large consumption of salt is attended with injurious results, and there is not the slightest evidence to show that it is in any way associated with the production of cancer, as has sometimes been asserted.

As the human body contains altogether about seven pounds of mineral matter, most of which is to be found in the bones, one is rather surprised to find that we only require about two-thirds of an ounce of mineral matter daily, and apart from the addition of salt which is probably superfluous, the ordinary daily mixed diet is capable of supplying more than this quantity. Sodium, potassium, calcium, magnesium, iron, phosphorus, sulphur, chlorine, are the most essential mineral constituents of the food. Sodium is found chiefly in animal foods, potassium chiefly in vegetable foods—potatoes being especially rich in it; calcium (lime) is especially abundant in milk, eggs, rice, asparagus, and magnesium usually goes hand and hand with it; iron exists in fairly large proportions in spinach, yolk of egg, beef, apples; whilst phosphorus and sulphur are common in most protein-containing foods, cheese, haricot beans, and mutton being notable for the quantity they contain.

Water.—The importance of water in the human economy is manifest when we realise that quite 70 per cent. of the weight of the body is made up of water. It is to be met with not only in the actual tissue substance and as the chief ingredient in all the fluids of the body, but also in transit through the external and internal linings of the body. Without such watery transudation not only would the skin be extremely uncomfortable and the mucous and other lining membranes become painfully evident because of increased friction, but the body itself would suffer serious damage, because its temperature is regulated by this means.

Roughly speaking, about 4½ pints of water are excreted from the body daily, and of this quantity about one half escapes by the kidneys, containing in solution, urea, uric acid, and other waste matters from the breaking down of proteins; a little more than a quarter is excreted by the skin as sweat and sebaceous matter, containing some of the fats; a little less than a quarter by the lungs in the shape of watery vapour holding in solution waste matters from the breakdown of the carbohydrates and fats; and the residue (about 2 per cent.) escapes by the bowels. In a vegetarian, however, as much as 10 per cent. may be excreted by the bowels, creating a much more abundant and softer stool than in a mixed feeder.

It is important to note that more water is excreted than is ingested, because about 10 or 12 ounces are actually manufactured from the tissue itself during the process of combustion. It is, however, manifest that the balance must be supplied in the food and fluids consumed, and about half of the whole weight of solid food consists of water. This would leave a little more than two pints to be supplied in an actual fluid form, and it is probably judicious to drink the equivalent of six tumblerfuls of fluid each day. A considerable quantity is consumed as tea and coffee or similar beverages, but the more one can take as pure water the better, because one of the chief functions it subserves is to carry off in solution waste products from the body, and pure water is the best solvent known to chemists. Fat people and those who are out of condition are able to accommodate as much as five pounds of useless water in the interstices of their tissues, and one of the objects of training is to rid the body safely of this excess of fluid. Where a large proportion of protein is consumed the tissues are relatively free from water, whereas the body tends to become richer in water when the fats and carbohydrates are in excess in the diet.

Where the digestion is not impaired, it is an advantage to partake of water or other bland fluid at meal-times, as a better distribution of nutrient material is thereby obtained. Many people who live in a city, however, find that they are apt to suffer from indigestion if fluid is abundantly supplied at meal-times, and this is doubtless due to the fact that the stomach has become atonic and cannot effectually expel the fluid. It should be noted that fluids are always expelled from the stomach before solids.

The best time to take fluid is first thing in the morning and last thing at night, and most people find that a tumblerful of cold water in the morning immediately on rising and the same quantity of hot water at night just before retiring are valuable adjuncts to their diet, enabling them to obtain with comparative ease a daily evacuation of the bowels.

FOOD AND BODY BUILDING

We must now pass on to consider the method whereby these various alimentary principles are made available for the purposes of the body, and although the subject is one of entrancing interest, we must dismiss it in the briefest fashion compatible with its appropriate comprehension.

With the exception of water, none of the alimentary principles are in a state capable of incorporation with the body cells. Without being dissolved in some form or other they are unable to enter the circulation, and it is quite possible that even water undergoes some change before this occurs. To effect this change some process is therefore essential, and for this purpose the various organs of digestion exist. The shortest and most arresting definition of digestion indeed is *solution*, and in any case this is the keynote of the various changes produced by the digestive fluids.

Digestion of Starch.—Digestion begins in the mouth, where by means of mastication the food is comminuted and mixed with saliva. This fluid contains a ferment which converts the insoluble starch of such foods as bread and puddings into the more soluble form of maltose or malt sugar. This transformation does not take place in one stage, for there are several steps in the process, and unless the food has been carefully cooked hardly any maltose is formed in the mouth at all. Ptyalin, however, which is the name of the ferment, is able to carry on its salutary work of conversion in the stomach for something like half an hour after the food has been swallowed, or at all events until the bland alkaline saliva has been neutralised by the acid gastric juice. The stages in the best circumstances in the mouth are starch, dextrin, maltose, and the process is not advanced much further in the stomach, although any cane sugar present may be decomposed (or inverted as it is called) by the acid of the gastric juice and ferments contained in the swallowed food into grape sugar (dextrose) and fruit sugar (lævulose).

Up to this point none of the uncooked starch has been changed in any way. It is therefore manifest that digestion is hastened and economy effected if all starchy foods are cooked before consumption. This cooking swells up the starch grain, which therefore ruptures its insoluble coating of cellulose and is quickly transformed into dextrin by the heat. For this reason even bread is the better for being subjected to a second baking process in the oven, and what is called zweiback (double-baked) or pulled bread is quite a favourite form in which to eat bread.

After being ejected from the stomach into the intestinal canal all carbohydrate, whether cooked or uncooked, so far as it can be reached through its envelope of cellulose, is attacked by the amylopsin—a ferment in the pancreatic fluid—and converted into one of the sugars, usually maltose. Finally this mixture of sugars, maltose, lactose, cane sugar, and lævulose, is, by means of another ferment called invertase, changed (in large degree at any rate) into glucose (grape sugar), the most convenient form for absorption.

Digestion of Protein.—The proteins, which are practically always eaten cooked, and in contradistinction to the carbohydrates thereby rendered less digestible, because they not only become coagulated but also contracted and more concentrated in the process, undergo no digestive changes in the mouth. In the stomach, however, they are met by the gastric juice, a fluid containing pepsin and hydrochloric acid, and under its influence pass through a series of compounds termed acid-metaproteins, proteoses, peptones, polypeptides, each one being a protein in a stage more soluble than its predecessor, until after the acidity has reached a certain stage they are propelled into the duodenum or the first part of the alimentary canal.

The mixture of food is at this stage called chyme, and by a complicated and highly interesting process its acid nature stimulates the walls of the duodenum to send an actual chemical messenger or hormone right through the blood into the liver and pancreas, thus intimating that the time has come for them to put forth their digestive efforts. This results in the outflow of bile and pancreatic fluid, the latter containing a ferment called trypsinogen, which is luckily inactive so long as it remains in the pancreas, otherwise it would soon digest it. Shortly after entering the intestinal canal, however, it meets a friend termed enterokinase, and this converts it into trypsin, a ferment four times more powerful in its effects on protein than the pepsin of the gastric juice. It acts, however, in an alkaline medium, and so alkali-metaprotein, proteoses, peptones, and polypeptides are formed as before, but a final stage is reached termed amino-acids, and this is all-important because it is the form in which, or immediately antecedent to which, proteins are absorbed.

Digestion of Fat.—Fats are practically unaffected in the mouth and the stomach, and are indeed somewhat of an incubus there, because they have a tendency to interfere at least with gastric digestion by diminishing the outflow of gastric juice. When they reach the small intestine, however, they meet their fate in lipase (the fat-splitting ferment of the pancreatic fluid), and become split up into fatty acids and glycerine, constituting a milk-like solution termed an emulsion.

Absorption.—The interior of the small intestine is dotted all over by a huge number of hair-like processes termed villi, each containing a lacteal and a very tortuous capillary blood-vessel. The mixture of soluble carbohydrates, proteins, and fats with the disassociated mineral salts and water, freely bathes these villi and permits of the absorption of the fatty acids, now converted into soaps by union with the alkaline salts of the bile through the lacteals, and the grape sugar, amino-acids, water, &c. through the capillaries. In this way the food reaches the circulation and is conveyed by the blood to the furthermost recesses of the tissues—each cell of which has immediate access to the nutrient fluid.

Just what takes place in the circulation is not quite clear, although certain facts are well known, *e.g.* that all the carbohydrates pass into the liver, where they are converted into a substance called animal starch or glycogen, constituting a storehouse for the subsequent necessities of the body, chiefly as food for the muscles. Before passing to the muscles it is again transformed into grape sugar where it is utilised, and if for any reason the muscles are unable to make use of it, it is excreted by the kidney and the disease termed diabetes is present.

It is also known that the tissue cells themselves contain ferments analogous to ptyalin, pepsin, lipase, &c., which attack the tissues in appropriate conditions, *e.g.* after death during putrefaction, but are unable to digest living tissues because of the presence of antiferments which counteract their effect.

The intricate changes occurring in the tissue cells themselves, however, are quite unknown. All we know is surmised from the nature of the excretions which are eliminated from the body, the fats and carbohydrates being finally resolved into carbonic acid and water and the proteins into the same substances with the addition of urea, uric acid, creatinin, and sulphates. These end-products are compatible with the belief, which now amounts to a certainty, that the tissue cells themselves are constructed from the alimentary principles and that they are constantly being consumed by a process of slow combustion. This is termed oxidation, because in large measure it takes place under the influence of the oxygen which has been extracted from the atmospheric air and carried in the red-blood corpuscles up to the very walls of the cells. The results of this slow fire are the products mentioned above, which are expelled from the cell into the blood and carried outside the body through various portals—the kidneys, the lungs, the skin, and the bowels.

The cells are thus able to repair their waste substance by appropriating the food supplies in the nearest circulating channel and building them up into their own tissue. It was at one time thought that this could only be effected by proteins, which were the essential food of the cells. But this theory was shattered by two eminent German scientists, Fick and Wislicenus, who in 1865 climbed the Faulhorn, using only non-nitrogenous food during the feat, and finding that their excretion of nitrogen, the peculiar possession of the proteins, was quite insufficient to have produced anything like a tithe of the energy represented by the work done. It is still known that it is impossible to manufacture tissue or flesh substance without protein, but this is wasted in much smaller quantities than was at one time believed, and its expenditure can be very much reduced by a proper reliance on fats and carbohydrates.

It is now well known that the nitrogen of the major portion of protein food is expelled unutilised from the body, the protein having been broken up to obtain, for energy-producing purposes, its carbonaceous molecule. It is hardly fair to allege, and indeed there is no proof to support the hypothesis, that this non-nitrogenous portion of the protein is any more valuable than fats and carbohydrates, and if it be not, then there is no rational basis for eating more than a very limited quantity of protein. It is also a remarkable fact that, except during convalescence from serious illness or for a day or two at the beginning of a holiday, it is impossible to store up as a reserve in our tissues any of the excess protein food we consume, whilst fats and carbohydrates are freely stored up, usually in the form of adipose tissue.

I have already mentioned that exercise does not increase the output of nitrogen, showing that neither protein food nor protein tissue is used for the production of energy. Carbonic acid, on the other hand, is excreted in greatly increased quantities during exertion, and this proves that energy is derived from the combustion of fats and carbohydrates.

Functions of the Various Alimentary Principles.—It is clear, therefore, from what we have seen that the tissues proper, *i.e.* flesh and the various organs, can only be built out of proteins, mineral matter, and water, and that these alone have the power to manufacture and repair tissue.

On the other hand, energy or work, and its by-product heat, can be obtained from any of the food principles, and as adipose tissue wherever it may be deposited is simply a reserve store of energy, it may also be built up from any food substance. It is manifest that fat may form fat. We know from feeding pigs on a diet composed solely of potatoes, that carbohydrates can form fat, and we have seen that proteins have a non-nitrogenous molecule which may be used for the same purpose. The big meat-eater is almost always obese, and as he grows older has a tendency to be diabetic, or at any rate to pass sugar in his urine. Fat, of course, is not flesh, *i.e.* tissue, but it is body substance. So it is interesting to note that the body can grow in bulk either by the increase of its fleshy substance or by the deposit of fatty substance. When, however, a human being reaches full growth, which is attained at the latest by the twenty-fifth year of life, there is no further possibility—unless during exceptional circumstances, some of which I have already mentioned—of adding to his flesh.

Hence after this period of life, food is simply required (1) for repairing the daily wastes of the tissue, and this is effected by proteins in conjunction with mineral matter and water; and (2) for supplying energy necessary for the daily work, and this may come from carbohydrates, fats, or nitrogenous substances such as proteins, or relations of theirs called albuminoids, of which gelatine is a typical example. Doubtless also water and mineral matters play an important part in the process.

Any food in excess of this quantity is either rapidly burned up and excreted from the body without being used, and this is what happens to the surplus nitrogenous material in every case and in many thin people to all the surplus food; or else manufactured into fat, which is deposited under the skin in the abdomen, back, and flanks, face and neck, and this is the fate not only of the fats and carbohydrates but even of the non-nitrogenous portion of the proteins.

The Folly of Fasting.—When, on the other hand, food is administered in quantities insufficient to repair the daily waste, then the reserve store of glycogen in the liver is first called upon, thereafter the adipose tissue is laid under contribution, and finally the protein tissues themselves are compelled to sacrifice their substance to the urgent demand for fuel for the production of energy, to keep the internal machinery of the heart, lungs, digestive organs, &c. at work, and heat, to facilitate their functioning. It is painfully pathetic to read of the victims of the fasting craze who, under the misconception that they can burn up all the accumulated waste matter of the body only and therewith rid themselves of all seeds of disease, at the same time leaving their bodily tissues clean, pure, wholesome, and intact, submit to days and even weeks of starvation under the euphemistic title of "fasting for health." I was gravely informed the other day of one who had triumphantly and successfully passed through the ordeal for over thirty days, and was assured that not a vestige of disease existed; but impatient to claim her reward in renewed vigour, broke her fast just one meal too soon, and succumbed to the effects. It is ludicrous were it not a matter of such serious import to listen to the unmitigated nonsense, supposed to be science, which emanates from the votaries of this practice. Elsewhere I have used the following language to describe the effects likely to be produced by fasting: "The simile which best fits the fasting man is not that of a furnace whose bars are choked with ashes and whose flues are clogged up with soot, so that a general conflagration is welcome to clear away the obstruction in order to produce more effective combustion. It is rather that of a furnace which has disposed of its extraneous combustible material and proceeds to attack the furnace bars and flues and even the very boiler plates themselves, so that an explosion is imminent.'[1]

QUANTITY OF FOOD REQUIRED DAILY

We must now pass on to consider the means at our disposal for determining the amount of food necessary to satisfy the nutritive requirements of the body. These may shortly be classified as "scientific" and "experimental," and it may be admitted at once that no method is altogether satisfactory.

[1] See *Modern Theories of Diet* (Arnold), p. 331.

Scientific Determination of the Quantity Required.—It is easy to understand that if we could estimate the amount of nitrogen, carbon, and oxygen contained in the excretory waste matters of the body, we could form a very fair estimate of the amount and character of the food required to provide it with pabulum sufficient for repair and the production of energy. For practical purposes the nitrogen and carbon alone are computed, the former in the urine and fæces and the latter in the expired air. When the amount of nitrogen excreted is as nearly as possible balanced by the amount ingested in the food, then the body is said to be in a condition of "nitrogen equilibrium"—a pretty fair index of health. Assuming that an individual were to excrete 300 grains of nitrogen and 4800 grains of carbon, it would be possible to estimate the amount of meat and bread which would supply these quantities. Meat contains about 11 per cent. of carbon and 3 per cent. of nitrogen, hence 6 lb. of it would give us 4800 grains carbon and 1309 grains of nitrogen, or 1009 grains too much. Bread contains 30 per cent. of carbon and 1 per cent. of nitrogen, hence 4 lb. would give 9000 grains of carbon and 300 grains of nitrogen, or 4200 grains too much carbon. By eating meat alone we should require to consume 4½ lb. too much to get enough carbon. By confining our attention to bread alone we should require to consume 2 lb. too much to get enough nitrogen. By combining the two substances we could get a reasonable amount of daily nutriment as follows:

	C.	*N.*
14,000 grains (2½ lb.) of bread contains	4200	140
5,500 ,, (¾ lb.) of meat contains .	605	165
	4805	305

This is, however, a very clumsy method of computation, and is never employed nowadays.

The scientific method in use is founded upon the conception of food as fuel. When fuel is burned, it is consumed, giving up its heat, which may be transformed into energy, and its constituent parts are disassociated from their organic union of carbon, hydrogen, and oxygen, reappearing as carbonic acid and water when the combustion is complete. A precisely similar process takes place in the human body when fats, carbohydrates, and proteins slowly undergo the series of changes which consume them with the production of heat and energy, and the excretion from the first two of carbonic acid and water, and, from the last, of these same products with urea, uric acid, creatinin, and sulphates in addition.

It is quite easy to ascertain the amount of heat emitted by employing a "bomb" calorimeter, an instrument so constructed that a measured quantity of water absorbs the heat, the amount of which is clearly shown by a thermometer. It is found that when a gram of carbohydrate or protein is enclosed in the little central chamber of the calorimeter and ignited by an electric current it can raise the temperature of a kilogram of water to 4·1° C., whilst 1 gram of fat completely consumed imparts a temperature of 9·3° C. to the water. The unit employed is called a (large) calorie, and hence:

1 gram (nearly $\frac{1}{30}$ of an ounce) of dry protein	=4·1 Calories
1 gram (nearly $\frac{1}{30}$ of an ounce) of dry carbohydrate	=4·1 ,,
1 gram (nearly $\frac{1}{30}$ of an ounce) of dry fat	=9·3 ,,

With these facts in our possession it is a simple calculation to estimate the number of calories in any food whose percentage composition is known. Medium fat beef, for instance, contains 76·5 per cent. of water, 20 per cent. of protein, 1·5 per cent. of fat, and 1·3 per cent. of ash or mineral matter. Water is a most valuable medium for assisting the oxidation and other processes which are necessary for the production of energy, but does not contribute in any direct fashion to its amount; the rôle played by mineral matter we can only surmise, but in all probability it is likewise only adjuvant. Hence we have only to take into account the protein and fat.

One ounce of dry protein or dry carbohydrate produces 116 calories of heat on combustion so far as it is complete in the body, and 1 ounce of pure fat yields 263 calories; 1 ounce of fat being therefore equal in energy value to $2\frac{1}{4}$ ounces of protein or carbohydrate. Therefore, 1 ounce of beef with the above composition will contain $20 \times 1{\cdot}16$ calories of protein $= 23{\cdot}2$ calories, and $1{\cdot}5 \times 2{\cdot}63$ calories of fat $= 3{\cdot}8$ calories.

In a similar manner 1 ounce of Cheddar cheese, which like most cheeses contains about one-third water, one-third protein, and the other third fat, will contain $33{\cdot}3 \times 1{\cdot}16 = 38{\cdot}6$ calories of protein, and $33{\cdot}3 \times 2{\cdot}63 = 87{\cdot}5$ calories of fat, more than twenty times as much as medium fat beef. Of course all cheeses are not so rich in fat, and most good beef contains a little more than 1·5 per cent. of fat, but the calculation is not far from the truth. It has indeed been asserted that a cheese of 20 lb. weight contains more nutriment than a sheep's carcase of 60 lb., and at about one-sixth of the cost, proving that cheese is a substitute for meat of quite transcendent importance in a poor household.

Given a knowledge of the percentage composition of any food it is not difficult in this way to estimate its caloric value, and I append the following short table complete from the Battle Creek Sanitarium diet-list, which may prove useful for reference. (See p. 223.)

The Work of the Body.—It must not, however, be supposed that the energy in an ounce of these foods is as available in the human body as it is when completely burned up in a calorimeter. Losses are sustained during digestion, for, as we have already seen, few if any foods are digested absolutely and fewer still are completely absorbed. In addition to this, proteins are never totally consumed in the body, quite one-fifth of their value escaping in the urine unoxidised. It is also important to remember that a great deal of energy is utilised in the processes of mastication and digestion, and Zuntz has calculated that as much as 48 per cent. of the digested material from hay used in feeding a horse is dissipated in this fashion. It is estimated that in a human being no less than 2800 foot-tons of energy are expended each day in keeping the circulation, respiration, and digestion in working order and maintaining, by evaporation and radiation from the skin, the temperature at the normal amount of 98·4° F. In other words, if employed to work an elevator this amount of energy would raise a weight of 2800 tons one foot high.

It is incredible to think that this amount of energy must be expended before one stroke of external work is done, and even more amazing to know that to produce 300 foot-tons of labour each day the body must actually provide another 1500 foot-tons which is thrown off in heat. This is, however, a better result than that shown by the best steam-engine in existence, in addition to which the body utilises the heat for improving the value of its functions.

It has been found possible, by using a much larger instrument called a respiration calorimeter, in which a human being may be enclosed for as long as two weeks, to estimate not only the output of work but also the total heat, carbonic acid, and water output of an individual, as well as to measure the oxygen which he inhales. The amount of course varies with the size, age, sex, and degree of bodily activity; but a man of average size, weighing 66 kilograms and at rest within the calorimeter, has been ascertained to have an energy requirement for 24 hours of close upon 2300 calories. This might be looked upon, therefore, as the minimum energy value of the food necessary to keep such an individual from losing body substance and either eating in upon his reserves or living upon his own flesh. Expenditure of energy in any form, whether muscular, mental, or otherwise, would of course require a corresponding allowance of food, and it is calculated that an average man in the ordinary pursuit of his daily vocation requires something between 2600 and 3200 calories of food value.

Experimental Determination of the Quantity of Food.—Needless to say, it is seldom that such methods of research are invoked to determine the amount of food required, but their description gives an opportunity for explaining many invaluable points connected with diet. It is much more usual to adopt the experimental or empirical method, where the actual food supply of healthy individuals is noted and the excretions from kidney, bowel, &c. fully analysed to discover whether the expenditure is properly balanced. An extension of this system in the form of deliberate feeding experiments upon selected individuals has now been much in vogue in various countries, and the observations in large measure corroborate the results obtained by calorimetry and other scientific methods. The fuel value of the food required varied from as little as 2000 calories for sedentary individuals to as much as 6000 calories for those engaged in laborious occupations.

This is, of course, much too wide a latitude to be of any real practical value to the individual who wants something more precise. The following figures have been supplied by Von Noorden of Vienna. He suggests that the maintenance diet for a man weighing 70 kilograms (*i.e.* 168 lbs.) should be

about 30 calories per kilogram when resting in bed = 2100 calories;
,, 32–35 calories per kilogram when confined to the house = 2240–2450 calories;
,, 35–40 calories per kilogram when taking light exercise = 2450–2800 calories;
,, 40–45 calories per kilogram when taking moderate physical exercise = 2800–3150 calories;
,, 45–60 calories per kilogram when engaged in severe labour = 3150–4200 calories.

After long consideration I am satisfied that the average business man is amply provided for by 2700 calories of food per day.

Caloric Value of Common Foods

Ounces in an Ordinary Helping.	Food Stuff.	Calories per Ounce.				Total Calories in an Ordinary Helping.		
		Proteins.	Fats.	Carbo-hydrates.	Total.	Proteins.	Fats.	Carbo-hydrates.
¼	Almonds	24·5	146·4	20·2	191·1	7	38	5
⅞	Almond Butter	26	152·8	21·4	200·2	23	133	19
5½	Apples	2·75	7·15	91·3	101·1	2	7	91
3¼	Apple Tart	4·76	11·19	41·7	57·6	14	33	128
3½	Bananas	1·5	1·6	25·7	28·8	5	6	89
3½	Barley (Pearl)	2·97	·87	27·24	31·08	9	3	88
3¼	Beans (Kidney)	8·2	·5	21·6	30·3	27	1	72
¾	Biscuit (Granose)	14·1	1·9	83·6	99·6	10	1	64
3	Blackberries	1·5	2·6	12·7	16·8	4	8	38
3	Blanc Mange	38	36·4	17·3	57·5	11	111	53
½	Brazil Nuts	19·8	178·1	8·2	206·1	9	87	4
2	Bread (Maltweat)	15	3·4	90	108·4	30	7	180
2	,, (Wholemeal)	11·3	2·4	58	71·7	24	5	121
4	Cabbage (Boiled)	·8	6·1	1·9	8·8	3	19	
1½	Cake (Sponge)	12·4	14·2	94·2	120·8	20	23	1
2	Cheese (Cottage), *i.e.* Home-made from Milk	19·9	12·4	5·1	37·3	40	25	1
¾	Corn Flakes (Toasted)	10·8	1·4	91·3	103·5	7	1	6
3	Custard Bread-pudding	8·75	46·08	67·24	122·07	23	133	1
2½	Cutlets (Nut)	22·95	23·3	15·26	61·5	56	57	37
1¼	Eggs (Poached)	16·3	32	...	48·3	26	42	...
2½	,, ,, (on Toast)	14·1	18·28	25·36	57·76	36	47	67
½	Filberts	18·2	174·1	15·2	207·5	9	84	7
2¾	Macaroni au Gratin	10·8	15·88	17·85	44·5	30	45	50
6	Milk	3·8	11	5·8	20·6	22·8	66	34·8
⅞	Nut Butter	34·2	124	20	178·2	28	105	17
½	Nuts (English Walnut)	19·4	169·2	18·2	206·8	9	82	9
2	Nutton	20·8	11	12·2	43	42	22	25
4¼	Oatmeal (Cooked)	3·3	1·3	13·4	18	14	5	56
⅓	Olive Oil	...	264·1	...	264·1	...	100	...
2½	Onions (Boiled)	1·13	4·29	5·1	10·52	3	10	12
5	Oranges	·9	·5	13·5	14·9	4	2	69
3	Parsnips	2	11·85	11·31	25·2	6	36	33
¾	Peanuts	30·1	102·9	8·5	161·5	22·5	77·1	6·3
4	Pears	·7	1·3	16·5	18·5	3	5	67
½	Pecans	11·2	188	17·8	217·8	5	87	8
½	Pine Kernels	39·5	131·7	8	179·2	23	72	5
3	Potatoes (Baked)	3·4	·4	28·9	32·7	11	1	88
...	Prunus Perfect Food	23·0	50	20	93	46	100	40
3¼	Pudding (Cream Rice)	4·25	22·1	19·63	45·98	14	72	64
1	Raisins	3	8·8	88·8	100·6	3	9	88
4	Rice (Boiled)	3·3	·3	28·5	32·1	13	1	111
4¾	Soup (Clear Tomato)	3·1	7	8·9	19	17	36	47
⅕	Sugar	...	...	116·6	116·6	...	...	25
1	Zwieback	11·4	26·4	85·8	123·6	11·4	26·4	89·8
3½	Beef Juice	5·42	1·71	...	7·13	19	6	...
2½	Beef (Roasted Fat)	18·14	136·85	...	155·26	48	352	...
3¼	Chicken (Boiled)	24·6	6·56	...	31·16	79	21	...
5	Cod Fish	19·3	1·02	...	20·32	95	5	...
2¾	Goose	18·1	95·14	...	113·5	48	252	...
3½	Lamb (Roast)	22·2	33·3	...	55·5	80	120	...
2	Lobsters	19	4·8	...	23·82	39	10	1
2½	Mutton (Boiled Leg)	29·1	54·1	...	83·2	70	30	...
3½	Oysters	7·2	3·23	...	10·43	24	12	14
1	Pork (Bacon)	11·3	177·3	...	188·6	12	188	...
2¼	,, (Ham, Boiled)	25·4	68·4	...	90·3	56	144	...
3	,, (Loin Chops)	18·5	84·5	...	103	54	246	...
2¼	Salmon	20·4	46·6	...	66·6	45	105	...
1¾	Trout	22·2	55·5	...	77·7	40	10	...
1¼	Turkey	24·1	59·1	...	83·2	29	71	...
2½	Veal	30·4	11·2	...	41·6	73	27	...

How much Protein is Required?—This is one of the most difficult and contentious problems in the whole range of dietetics. One school maintains that you require at least 125 grams, *i.e.* about 4 ounces, whilst another insists that not more than one half of this, or about 60 grams, is ever required by anyone. The explanation of this serious difference is simple enough, for it is found that nitrogen equilibrium may be maintained on very variable quantities of protein. From the remarks we have already made it will be apparent that the problem is complicated by the fact that proteins can be utilised in the body both as building material and fuel substance. We must therefore decide whether it is feasible, and if so healthy and legitimate, to reduce the supply of protein to the exact amount required for repair purposes, relying entirely on the carbohydrates and fats for providing heat and work, or use the protein for the double purpose. Upon our answer to this question will depend our position as supporters of those who like Chittenden advocate the minimum supply of protein, or those who like Voit adhere to the regulation standard. There is much to be said on both sides of the question.

Voit insists that a full supply of protein is essential to a full measure of health and strength, to maintain a powerful opposition to the incidence of disease, a vigorous digestion, and to impart such stimulation to the system as betokens the possession of vital energy.

Chittenden, on the other hand, argues that no protein can be stored in the tissues, that excess of protein propagates toxins which gain access to the circulation and poison the body, that energy is lost in excreting the surplus protein, that disease is eradicated and the body rendered much healthier on a low supply of protein.

The truth apparently lies midway between the views of the two protagonists, as a careful analysis of the average diet-list will determine, but I am personally convinced that the amount of protein necessary is certainly an individual question which is settled for each by a little experience and reflection. Any person who never takes less than 1 gram of protein per kilogram of his body weight, *i.e.* for a man weighing 10 stones about 2 ounces of protein, is not likely to go far wrong so long as he eats a sufficiency of carbohydrates and fat to supplement it. This is, however, a most important point, as within limits the greater the quantity of fat and carbohydrate supplied along with the protein the less is the latter used for supplying heat and work, and the more therefore is available for tissue-building purposes. This is what is meant when it is stated that fats and carbohydrates are "protein sparers," and the ideal condition would be to find the exact quantity which would allow the body to use all the nitrogen in protein for purposes of tissue repair.

On the above basis the full amount of protein requisite for a day's allowance would be equal to $60 \times 4{\cdot}1 = 246$ calories, and would be found in 12 ounces of beef, 10 ounces of lamb, 8 ounces of mutton, 35 oysters, 12 ounces of salmon—none of which contain much in the way of fat and no carbohydrate at all; 10 ounces of almonds, 3½ pints of milk, 6 ounces of pine kernels, 10 eggs, 8 ounces of cheese—all of which contain either carbohydrates or fats and some of them both.

On the other hand, those who accept the higher standard of 125 grams, over 4 ounces of protein, would require to eat 20 eggs, or about 5 platefuls of cooked meat (20 ounces), in order to assure their day's allowance of protein. Doubtless the man who takes from 80–90 grams, about 3 ounces of protein daily, will not sustain any damage thereby and is certain to be amply catered for.

The Requisite Quantity of Fat and Carbohydrate.—It may be inferred from what has been said that this will depend on the amount of protein consumed. If we allow 80 grams, or 328 calories, of protein and agree that 2700 calories are required daily, that would leave roughly 2370 calories to be supplied by non-nitrogenous food. So far as the tissues are concerned it would not matter whether we decide to select these either from fat or carbohydrate, but there is a limit to the digestive capacity for the former and indeed for the latter. It is largely, however, a matter of temperament and nationality, the Esquimaux depending largely upon fat and the Hindoos on carbohydrate. There should be little difficulty in the digestion of 100 grams of fat per day, and that would be contained in 5 ounces of butter, and represent 930 calories, leaving 1470 to be provided by carbohydrate. About 14 ounces of sugar, or 370 calories, would fulfil the daily demands of the system for carbohydrate.

Needless to say, these proportions are not accepted by all. Dr. Kellogg of Battle Creek Sanitarium firmly believes in a low-protein fleshless diet constructed as nearly as possible of 10 per cent. protein, 30 per cent. fat, and 60 per cent. carbohydrate, whereas the diet we have been considering has close upon 14 per cent. of protein, more than 30 per cent. fat, and less than 60 per cent. carbohydrate.

THE NECESSITY FOR A MIXED AND VARIED DIET

It is almost unnecessary to state that it would hardly be possible to live for any length of time on a combination of pure protein, pure fat, and pure carbohydrate. It would not only be inconvenient but ultimately become decidedly nauseous. The nearest approach to such a combination with which I am acquainted was consummated by a patient of my own who had been living on a pure fruit and nut diet and suffered severely from indigestion and malnutrition. He was unable to take milk, but each day made the following concoction: 4 raw eggs, 1 ounce of olive oil, and 1 lb. of steamed rice. These were carefully mixed up and divided into three meals, and despite the Spartan severity of the diet, proved such satisfactory nutrients that the patient gained weight rapidly.

For natural foods, it would hardly be possible to conceive of a simpler and more effective combination—olive oil being the simplest and purest fat; rice being practically the purest carbohydrate—it only contains 5 per cent. of protein, and no fat; and eggs containing the purest of protein along with a little fat, no carbohydrate, and a large number of protein-like substances containing phosphorus, iron, and a most important body called lecithin, all of the greatest value in administering to the demands of a healthy nervous system.

In time, however, even such a diet came to pall upon the appetite, probably because the patient became too fat upon it, and malnutrition again asserted itself. This is the reason which makes a varied diet an absolute necessity even although one were to supply a full measure of calories per day. Monotony in diet is detrimental to the best interests of the body.

Attempts have been made to live on single-article diets, but these have always been attended with disastrous consequences. I have elsewhere recorded the case of the medical man who partook of two meals each day, each containing only one, although usually a different, article of diet. Beef for lunch, milk for dinner, potatoes for lunch another day, or any other single item with a glass of water appeared on his own testimony to satisfy his requirements both physically and æsthetically. His early demise from a mental ailment was doubtless hastened by his ill-timed experimentation.

Folin has lived for a few days on arrowroot starch and water, and in a similar experiment on the tenth day Hammond was obliged to desist owing to debility and fever. Porridge, baked beans, and wholemeal bread have all been tried as exclusive diets, but as a rule had to be abandoned because of diarrhœa or some digestive disturbance. I knew an athlete who lived for a whole month on bananas and water, and said he was perfectly fit at the end of the time although he had lost weight.

Anyone who has followed with intelligence the statements I have made will see that experimenters along this line are guilty of the crassest folly, and perseverance in such a course demands punishment as certainly as an attempt at suicide. In this country there are few people so ignorant as not to know the dangers attendant upon such dieting, and further still, who are not guided by instinct or reason to a more substantial menu. Hence the futility of the argument that it is essential to eat standard bread to prevent being defrauded of valuable ingredients, all of which can be obtained in a much more satisfactory fashion from other foods. For example, fat can be obtained from butter or delightful margarine, and mineral salts from milk, even skim milk, and it is hardly possible to conceive of even the very poorest child being deprived of these humble accompaniments to the much-preferred white bread.

Milk: a Complete Food.—Appropriate food combinations have been attained by experience, and each nation and even district has its own list which fulfils all the nutritive requirements of the body. It will always be found that articles rich in carbohydrate or fat are combined with those containing large quantities of protein—bread and cheese, bread and omelette, bacon and beans, potatoes and beef, or cheese or even milk, being all well-known examples. Few people, however, will stop to think that none of these substances except milk was ever actually intended by Nature as a food and for no other object, and hence it comes that milk is practically the only food which contains all the alimentary principles in anything like the normal proportions. It is indeed the only substance which has any pretensions to be called a complete food, serving as the sole natural nutrient for many months in early life, and many adults have been known to subsist on it alone for years at a time and remain in abounding health and vigour.

Cow's milk is most frequently used, and contains in round figures 87 per cent. of water, 4 per cent. of protein, 4 per cent. of fats, 4·5 per cent. of sugar, and ·5 per cent. of mineral matter. This last ingredient is of great importance, containing as it does a large proportion of phosphates and lime and a small proportion of iron.

Its chief defects are its liability to be contaminated with disease germs and its rather serious constipating qualities. Boiling the milk, which kills the disease germs, only seems to increase the constipating effect, but this can be counteracted to a certain extent by eating wholemeal bread with it. A lunch of 10 ounces of such bread with a pint of skim milk will easily supply, at a cost of twopence, one-third of the nutriment required for the whole day, and this compares favourably with a restaurant lunch costing a shilling or more.

If mixed with equal quantities of cream it is an excellent natural cure for "acid" stomach, or heartburn, which is such a troublesome ailment for those who work in city offices.

For those who are "run down" or suffering from nervous exhaustion nothing can equal the restorative qualities of one tumblerful of hot milk three times a day in addition to the ordinary meals.

Whey is prepared by adding two teaspoonfuls of rennet to one pint and a half of milk heated to 104° F., carefully but thoroughly breaking up the clot which forms, and straining through muslin. It possesses few nutritive properties, and is chiefly used as an agreeable drink, although a whey cure consisting of nothing but whey, fruit, and vegetables is much in vogue for those who have lived too freely.

Cream, butter, butter-milk, "soured" or curdled milk, koumiss (fermented mare's milk), kephyr (fermented cow's milk), and many proprietary foods such as casumen, plasmon, protene, are all derived from milk.

Cheese perhaps is its most important product, however, and those who find it difficult to digest, may either eat it with zweiback after being carefully grated, or try the following excellent preparation. Chop or grate a quarter of a pound of cheese, dissolve a saltspoonful of bicarbonate of potash in a little water, place in a stew-pan and gently heat. The cheese will soon dissolve, and may be eaten in this form, or half a pint of milk and a couple of eggs added, carefully stirring all the time. Eaten with zweiback, oatmeal cake, or wholemeal bread, the body will easily be supplied with all the alimentary principles in ample proportions.

Another favourite way of preparing cheese is with macaroni as in the well-known *macaroni au gratin*. Soak 1 ounce of macaroni overnight in cold water until required, then pour off the water. Grate 4 ounces of cheese. Place a layer of grated cheese in the bottom of a well-buttered pie-dish, a little pepper, then a layer of macaroni, and so on alternately, having a layer of cheese on the top. Place in the oven for a few minutes to brown. This, eaten with toast, constitutes a complete food.

Eggs.—Eggs are amongst the most important articles of a mixed diet. An egg is an undeveloped chick, and therefore its constituents are practically those which will build up the living body. The shell consists chiefly of carbonate of lime, the white is almost a pure solution of protein, the yolk, besides protein, contains a large proportion of fat and several highly important substances for building up the nervous system. Amongst them are two very important minerals—phosphorus and iron—both in organic combination. Seven and a half eggs will supply for one day all the iron which the human body requires. Yolk of egg, therefore, is an extremely useful food for anæmic persons.

An egg contains a good deal more nutriment than the same weight of meat, but in different proportions. Despite this, however, an egg is not a complete food, because it contains no carbohydrate material. For this reason eggs ought to be added to rice or other cereals, and in this way a pudding becomes a complete food ; in the same way bread and butter eaten with eggs constitutes a complete food. When kept, eggs gradually lose a certain amount of their water, and become lighter. A fresh egg should sink at once in a solution of 2 ounces of salt to a pint of water, but the longer it has been kept, the nearer the surface it will be found. Eggs are easily digested, but it is a mistake to imagine that raw eggs are more easily digested than lightly boiled eggs. Two of the latter should leave the stomach in less than two hours. Fifteen to twenty eggs are equal in value to 2 lbs. of medium fat meat. A few methods of preparing eggs for dietetic purposes may be of some interest.

First : Cream Eggs.—Two eggs should be poached and placed on buttered toast. One ounce of butter melted in the stew-pan, a tablespoonful of cream, and a little pepper and salt. Make this mixture hot and pour it over the poached eggs.

Second : Egg and Spinach Toast.—One pound of well-washed spinach should be cooked in 2 ounces of butter in a double-pan cooker, passed through a fine sieve into a stew-pan, and four well-beaten eggs, with an ounce of grated cheese, added. The mixture should be stirred until it is thick, and then served on toast. Many other dishes of a similar character could be easily prepared, and for one who has to cater for himself they are extremely valuable. This is a favourite dish, highly nourishing and most valuable in anæmia, if the spinach does not disagree, but it is apt to be very irritating to the lower bowel.

Fleshless feeders will find a large selection of similar recipes in *The Food Reformer's Companion* (Miles).

Cereal Preparations.—We have already entered very fully into the characteristics of wheat, the best-known member of the class.

Oats are unquestionably the most nutritious of all the cereals, and contain a fair proportion of all the alimentary principles. It is impossible, however, to use it as the sole article of diet for any length of time, or even with the addition of milk, on account of its tendency to produce skin eruptions due to the irritating qualities of one of its ingredients termed "avenin."

Maize is hardly known in this country except for its preparations of hominy and corn-flour, athough toasted corn-flakes bid fair to become as popular as they richly deserve.

Barley is rarely used except as barley water, which, contrary to accepted opinion, contains only a little over a half per cent. of nutriment, the rest being water.

Rice is rich in starch, poor in protein, fat, and mineral matter, but is particularly easy of absorption.

The Pulses.—Beans, peas, lentils and their congeners are in a class by themselves. They are well supplied with protein in the shape of legumin—sometimes called vegetable casein—and contain much mineral matter, especially potash and lime. They have little fat, and hence go well with bacon or pork. They are by no means well digested, as they not only contain a large quantity of cellulose, but their protein is very rich in sulphur, which forms fœtid gases in the lower bowel. In addition, like many nuts they contain an irritant principle which is quite incapable of being tolerated by many people.

Pea-flour is a delicious preparation, rarely seen in the South though frequently used in the North, where it is called pease-meal. It is easily prepared by stirring it up with hot water or hot milk, adding a little sugar or preferably salt, and supping it with alternate mouthfuls either of fresh or buttermilk. Half a pound of pea-flour with a pint and a half of milk would supply all the essential ingredients of a day's food.

The pulses are freely used by fleshless feeders, even although they contain the equivalent of uric acid in goodly quantities. Much of this may, however, be removed by soaking them for from eight to twenty-four hours in water. Miles gives the following recipe for "Kedgeree" :

Two ounces of rice, 4 ounces of butter-beans, 1 onion, 1 banana, 1 ounce of butter, a little lemon juice, pepper and salt if required, 1 teaspoonful of curry powder, 2 eggs.

Soak the beans overnight, and cook them in a little water so that they absorb nearly all the water. Cook the rice in the same way. Chop the onion and banana fine, and fry them together in the butter, adding the curry powder and any liquor that may have been strained from the rice and beans. Cook the eggs hard, mince them and add them. Mix all together, make the mixture very hot, and serve with toast.

VEGETABLES—FRUITS—NUTS—AND FLESH FOODS

Vegetables.—Vegetables of all kinds are very much more used in France as dietetic agencies than they are in this country. The average British cook appears to have absolutely no conception of the method of cooking vegetables ; the ordinary method of soaking them in water and boiling them for a longer or shorter period, then discarding the water and serving up the mass of fibrous tissue which is left, is simply a means of wasting the only valuable part of the vegetable.

Most people have a very fair idea that the valuable ingredient of all vegetable matter is the mineral salts which it contains. Up till quite recently the rôle played by these mineral salts was by no means well understood. It is now known, however, that a deficiency of mineral matter may produce the most serious disease. A century ago, when England was dependent upon sailing vessels for a means of communication with other countries, scurvy was a very well-known disease. It was known to be produced by eating salt meat, and it could be easily prevented by a daily supply of fresh vegetables. As these, however, were not forthcoming on a long voyage, lemon juice containing valuable salts of potash in a very active form was substituted, and even to-day no British ship is permitted by the Board of Trade to travel without a large supply of this substance. Another disease which is not familiar in this country, but is very common amongst sailors in the East, who subsist largely upon rice, is called beri-beri. We have already referred to the fact that it is due entirely to eating rice from which the husk has been removed, and this extra coating of the rice grain contains a kind of phosphorus which is of immense value in the human economy. It has been established by experimental feeding of fowls with the same dry polished rice that a similar disease can be originated in them, and this can be quite easily cured by the addition of yeast, or indeed by adding the husks which have been discarded in the polishing of the rice.

These and many other facts well known to scientific men are evidence that the mineral salts contained in organic form in living vital association with vegetable material are of infinitely more value than those to be found on the druggists' shelves. Now boiling these vegetables dissolves out all those mineral salts, and the mess which it left is simply an inducement to indigestion. Hence to conserve those valuable mineral salts, vegetables should always be steamed, and as this is by no means an easy process for the ordinary cook, a special vessel consisting of one pan within another is utilised for preparing vegetables for the table. In lieu of these processes, ordinary vegetable soup is of immense value, containing as it does all the vital mineral salts so essential for the growth and repair of the body. Probably few people know that spinach is a much more valuable source of iron even than Blaud's pills, and it is a great pity that an agreeable method of preparation of this substance for the table should not be in vogue. Next to spinach the yolk of egg contains more iron than any other food known.

Fruits.—These consist chiefly of water agreeably flavoured. They may be divided into the food fruits and the flavour fruits, the former consisting of figs, dates, prunes, raisins. Dried figs are more nourishing than an equal weight of bread, and six ounces with a pint of milk make a satisfying meal. Milk and dates, half a pint of the one and half a pound of the other, constitute another alternative meal.

Nuts.—Nuts can hardly be overrated as articles of diet, though doubtless this statement will appear strange to the individual who eats a few after his dinner and supper and in all probability suffers from severe indigestion therefrom. Nevertheless, it is true that bulk for bulk they contain a greater amount of nutriment than any other food substance we know.

Almonds are among the most acceptable members of the class, and contain a highly digestible fat which constitutes 53 per cent. of the total weight of the nut; 21 per cent. of a protein much more soluble in the digestive fluids than the gluten of wheat, and which is also capable of dissolving or helping in the solution of the fat; and in addition about 10 per cent. of carbohydrate with mineral matter. From them can be prepared the most delicious butter of a highly nourishing character, and which by the addition of a little water can be made into a very efficient substitute for milk. Their great objection—and this they share with most nuts—is their large content of cellulose, which is of a particularly dense and unyielding character. For this reason, when using them as a food, either the most careful mastication must be practised—and this is not always possible for adults—or else the nut must be passed through a nut mill and so prepared for consumption. This need not be done every day. Once or twice a week at most a quantity can be got ready and stored in a glass

Table showing the Composition of Vegetables

	Water.	Dry Matter.	Crude Protein.	Starch.	Cellulose.	
Potatoes . .	75	25	2·2 80 per cent. lost when soaked in water	19·1	·6	Ash, $\frac{3}{4}$ Potash ,, $\frac{1}{5}$ Phosphoric Acid
Carrots . .	86·7	14	·5	10·1 chiefly Sugar	1·5	...
Parsnips . .	80·1	19	1·4	3 per cent. of Sugar	1·3	Ash, $\frac{1}{2}$ Potash ,, $\frac{1}{4}$ Phosphoric Acid
Cabbage . .	90	10	2	5·8	1·1	Easily digested raw
Cauliflower .	About	the same as	Cabbage	...	...	...
Beets . . .	Like	Carrots	...	...	...	...
Cucumber . .	96	4	A flavour	agent chiefly	·5	...
Lettuce . .	93	7	1·5	2·5 Starch and Sugar	·5	Contains good deal of Iron. A sedative
Onions . .	89·1	10	1·5	10·1 and essential oils	2·0	A stimulant to the bowel
Spinach . .	90	10	2·1	·3	1·1	...
Melons . .	92	8	·7	7·6 chiefly Sugars	...	...
Tomatoes . .	91·9	7	1·3	4 per cent. Sugars	...	...
Celery . .	93·4	6	1·4	3·3	·9	Said to cure Rheumatism
Rhubarb . .	94·6	5	·7	2·3	1·1	Said to cause Rheumatism

vessel, which is brought to table like a butter-dish or the sugar-bowl. Hovis, wholemeal, or Malt-weat bread spread with butter, with a thin layer of honey and a powdering of ground nuts, constitutes a pleasant mouthful of more than tasty character, because of its intensely nourishing and even digestible quality.

Walnuts may be used in this fashion, but it should be known that they possess an acrid property which is liable to disagree, setting up colic in some people. I have discovered that this is in the husk outside the kernel, and when it is peeled off the bad effects disappear. Nuts should never be eaten between meals, and it is most unwise to partake of them at the end of an otherwise sufficient meal. When used by vegetarians they are eaten in quantities amounting to about four or five ounces a day, and this is sufficient to provide them with most of the protein which they require. Chestnuts may be used alone, as they contain a fairly large proportion of carbohydrate. The peasantry of France use them freely in the following fashion. After the outside shell is removed they are blanched and steamed, and eaten with a little salt and milk. They are also sometimes ground into meal and made into flat cakes.

Flesh Foods.—It is convenient to apply this description to all those substances usually included under the definition animal food, although strictly speaking the latter term likewise embraces eggs, milk, and its products gelatine, beef-teas, beef-juices, and beef extracts. Flesh foods are still the most favoured articles of diet for supplying the body with building material or protein, and herein lies a great danger, because on account of their attractive character there is a tendency to consume considerably more than is required for the purpose of nutrition. Numbers of the middle classes eat 3½ lbs. of meat or its allies per head per week, while those of the upper classes eat close upon 6 lbs.

Even this does not constitute us the greatest meat-eating nation of the world, this distinction belonging to Australia, and it is probably more than a mere coincidence that this country has also the reputation of consuming per head of the population more pills and potions for the relief of constipation than any other country in the world.

Table showing the Composition of Fruit

	Water.	Protein.	Sugar.	Acid.	Kind, Chiefly.	
Apples . . .	85	·5	10·75	·92	Malic	... ...
,, Sweet . .	86	·5	11·75	·20	,,	... ...
Blackberries . .	88·9	·9	11·5	·75	,,	... ...
Strawberries . .	90·8	·95	5·36	1·4	,,	Antiseptic
Lemons . . .	84	·95	2	7·2	Citric	... ...
Oranges . . .	85	1·10	10	1·3	,,	... ...
Grapes . . .	83	1	10·16	1·2–5	Tartaric	... ...
Currants . .	86	...	1·96	5·8	,,	... ...
Grape Fruit . .	86	...	10	2·5	Citric	... ...
Peaches . . .	88	...	10	·5	...	A little Prussic Acid
Plums . . .	78	·5	22	1	...	Prunes (Dried Plums), laxative
Figs (dried) . .	20	5·5	62·8	...	...	Mildly laxative
Dates (dried) . .	20·8	4·4	65·7	...	...	... ...
Prunes (dried) .	26·4	2·4	66·2	...	...	... ...
Raisins . . .	14	2·5	74·7	...	...	... ...

Table showing the Composition of Nuts

(From Hutchison)

	Water.	Protein.	Fat.	Carbohydrates.	Cellulose.	Mineral Matter.
Chestnuts (fresh)	38·5	6·6	8	45·2		1·7
,, (dried)	5·8	10·1	10	71·4		2·7
Walnuts (fresh) . . .	44·5	12	31·6	9·4	·8	1·7
,, (dried)	4·6	15·6	62·6	7·4	7·8	2
Filberts and Hazel (fresh) .	48	8	28·5	11·5	2·5	1·5
,, ,, (dried) .	3·7	14·9	66·4	9·7	3·2	1·8
Sweet Almonds . . .	6	24	54	10	3	3
Pine Kernels	7·4	21·7	51·1	14	2·5	3·3
Cocoa Nut (fleshy part) .	46·6	5·2	35·9	8·4	2·9	1
,, (dried) . .	3·5	0	57·4	31·8		1·3
,, (milk) . . .	90·3	·5	...	9		...

The reason is not far to seek, for flesh, which is really muscular tissue and consists almost entirely of protein and water, is almost entirely absorbed, and thus leaves no residue for the bowel to act upon.

As most people know, meat should not be consumed for a day or two after the animal has been killed, unless it can be procured immediately after the animal has been slaughtered, and before what is called *rigor-mortis* sets in. During this time, which commences at a variable period after death, the flesh is decidedly tough, but when it passes away certain acids develop—chiefly sarcolactic acid—which render the flesh substance much more soft and easily digested. Various methods for imitating this process are in vogue; *e.g.* soaking beef in vinegar and water, rubbing lemon juice over veal before frying or stewing, and eating lamb with mint sauce. No doubt for a similar reason the use of vinegar favours the digestibility of the hard muscles of the crab and lobster.

Contrary to popular opinion, cooking reduces the digestibility of meat, raw meat being digested in about two hours, whilst roasted meat takes quite four hours for full digestion. For a weak stomach no more digestible substance could be found than the juice of a tender steak, and this is easily obtained by scraping with a blunt instrument such as the edge of a table-knife in the direction parallel to the course of the muscular fibre. This spreads the fibres and ensures the collection of the nutrient myosin or pulpy substance of the muscle, which can be seasoned with a little pepper, celery, or salt, and served either as a sandwich or stirred into broth.

Just as the feeding of an animal influences the flavour of its flesh, so the kind of meat we eat is not without its influence on the character of the individual. Compare the stolid, tolerant, beef-fed Englishman with the argumentative and opinionated porridge-loving Scot and the restless vivacity of the potato-fed Hibernian. Kean, the famous actor, carried the matter too far when he varied the food for the part he had to play, choosing pork for tyrants, beef for murderers, and mutton for lovers.

The most easily digested animal foods are soft-cooked eggs, sweetbreads, and boiled white fish, a liberal helping of either of these being disposed of by the stomach in something like two hours, whilst roast goose, pork, salmon, herring, and mackerel and other fat-containing substances may linger therein for more than double that time.

On the whole, however, fish is more easily digested than meat, and in any case is an agreeable change, providing a little more gelatine, a little less protein, and distinctly fewer stimulating extractives than meat. The fallacy that because fish contains phosphorus it is an excellent brain food has been exploded long ago. There are few foods which do not contain some proportion of phosphorus, and fish are by no means more noteworthy in this respect than others. But in any case the nutrition or functioning of the brain is not specially influenced by the administration of phosphorus in any form. Hence fish is no more likely to encourage thought than any easily digested or assimilated food may do by contributing to the growth and nourishment in the body.

Meat-Juice.—It is not at all a simple matter to obtain muscle protein or myosin apart from its fibres of connective tissue, &c., and the most popular of beef-juices are by no means so nourishing as they pretend to be, not comparing for a single moment with the nutriment contained in white of egg. The simplest homely method of preparing meat-juice is to cut up the meat into very small sections, soak these for a few hours in water with a little salt, and then squeeze the squares through a piece of muslin. The more elaborate process of first grinding the meat with a heavy pestle and then rubbing it through a fine wire sieve before soaking and straining through muslin is rewarded by a slightly higher proportion of protein.

Many meat-juices on the market are prepared by extraction under strong pressure and subsequent evaporation *in vacuo*, and contain from 15 to 30 or 40 per cent. of protein. These must not be confused with meat extracts, which in common with beef-tea contain very little protein or any other nutrient, and are mostly of value because of their stimulating extractives. They are. however, decidedly cheaper than home-made beef-tea as usually made, and distinctly more valuable. A special claim has been advanced by the proprietors of Bovril that its stimulating properties not only conduce to the better digestion of all protein foods, but also ensures that they are actually built up into the tissues themselves in a proportion from ten to thirty times greater than the weight of the dry Bovril administered. Whatever truth there may be in this statement is obviously of limited application, because we have seen that the power of the body for storing up nitrogen is very slight. In any case, no meat extract can contain anything which is not to be found in meat itself, so that its beneficial properties are not peculiar, and may be found quite as well in the ordinary flesh foods of popular acceptation.

THE SELECTION OF A SUITABLE DIET

No good purpose would be served by entering into more detail on the question of nutrients, and doubtless the average man will be better satisfied to know how to apply in a practical manner the information he has already acquired. Fortunately perhaps for himself, Nature has already taken this matter out of his hands, by decreeing that experience guided by a healthy appetite is the most convenient method for selecting the most appropriate articles of diet. Each nation has solved this problem for itself in very much the same way, and the results are of the most interesting character.

Volumes have been written upon this subject, and its study is most entrancing, as it is only natural to associate the success or failure of a nation with the food which supplies or fails to supply its energy and vitality. It is difficult, however, to draw any practical conclusions in connection with this question without special reference to climate and occupation, and it is found that a low temperature and hard physical labour necessitate a greatly increased quantity of food. With an indoors occupation, where the temperature is hardly less than the average out-of-doors summer temperature, the requirement of food will not vary much. Where, however, the indoor worker perspires very freely, then more food will be necessary to compensate for the large amount of heat carried off by evaporation of the perspiration.

Size and weight are of course important in determining the quantity of food, and for this reason the average woman eats about 20 per cent. less than the average man, whilst a child from five to ten years eats about half the quantity of the average man.

From the theoretical point of view, excessive labour should create a greater demand for the so-called energy-producing foods, fats, and carbohydrates, but experience teaches that proteins are called for in proportionate quantities. During the first week of a holiday and after a protracted illness there is a greater demand for proteins in the form of animal food, but this is soon gratified, as indicated by the appetite returning to the normal. The greater, indeed, the amount of muscular exertion, the greater is the quantity of food required.

Mental work, on the other hand, does not seriously encroach upon the reserves, as is evidenced by the fact that it appears to have very little effect in increasing the excretion of waste matters. Although it is well to recognise that there is no special brain food *per se*, nevertheless brain workers require an easily digested ration with a slightly augmented proportion of protein.

The scientific method of measuring the amount of food required is not of much value to the man at the dining-table. It is sufficient to state that the average business man pursuing a more or less sedentary occupation requires daily about 3 ounces of protein, 2 ounces of fat, and 12 ounces of carbohydrates. These quantities are of course water-free, and do not take into account the fluid originally contained in the food-stuff or added during the process of cooking. Roughly speaking, this is about 75 per cent. more, so that such an individual would eat in the course of a day a little over 4 lbs. of food in the condition in which it is served at the dining-table. Doubtless this is an eye-opener for many people, especially those who are in the habit of thinking and saying that they hardly eat anything at all, but it is quite a usual matter for a lusty young fellow to eat daily from 7 to 8 lb. of food as served in the ordinary course at meal-times.

Specimen Menu for a Day.—The following is a specimen of the food actually consumed in a day by a fairly active professional man, weighing 10 stone 7 lb., and no doubt will be more acceptable than many pages of instructions :

BREAKFAST, 8.15 A.M.

	Ounces.
Banana (one good-sized)	3½
Cooked cereal (3 tablespoonfuls)	¾
Milk (a good-sized teacupful)	6
Bacon (one rasher)	2
Egg (one good-sized)	1¼
Sugar (two lumps)	¼
Marmalade (large dessert-spoonful)	¼
Butter (four little balls)	½
Bread (two moderate slices)	4
Cream (two teaspoonfuls)	¼
Weak China tea (one small cup)	..
Total	18¾

DINNER, 1.15 P.M.

	Ounces.
Soup, tomato (one teacupful)	4¾
Bread (half a slice)	1
Meat (beef, a small helping)	4
Potato (one good-sized)	3
Cauliflower (two large tablespoonfuls)	3
Pudding (sago, a good helping)	3½
Prunes, stewed (seven or eight)	3¾
Cheese (piece 2×1×1 inches)	¼
Biscuit (one)	¼
Total	23¼

TEA, 5 P.M.

	Ounces.
China tea, weak (two small cups)	..
Sugar (four lumps)	½
Cream (two teaspoonfuls)	¼
Total	¾

SUPPER, 7 P.M.

	Ounces.
Bread (two moderate slices)	4
Butter (four little balls)	½
Fish (small helping)	5
Apples (stewed, two)	6
	15½

This makes a total of 58½ ounces, or nearly 4 lb. of food. Probably most business men consume a great deal more than this without obtaining much additional energy for their daily work, and a careful scrutiny of the amounts will reveal items which look ridiculously attenuated.

But although the body is able to accommodate itself to one or more occasional heavy meals, it is never wise regularly to eat even a little more than is essential to supply its requirements. The secret of successful nutrition is to vary the quantity and character of the food according to the amount of work. After hard muscular exertion a proportionately greater quantity of cereal such as rice, sago, or tapioca pudding, or even beans, peas, and lentils, may be consumed, whereas during a long series of sedentary working days, sweets, pastries, and most starchy foods must be reduced to a minimum, and easily digested protein foods such as chicken and white fish be selected.

During cold weather, pork, duck, eel, salmon, mullet, and other fatty fish, with an extra supply of bacon and butter, will best provide the caloric necessities, whilst during the heat of summer fatty foods of all kinds should be reduced to a minimum, and fruits and vegetables substituted.

Some kind of raw food should be eaten every day, if not at every meal, and for this purpose fruits in the ordinary form, or with vegetables in salads, will be found most convenient. To encourage mastication, some dry food such as Force, Triscuit, Grape Nuts, biscuit, or zweiback should be eaten at each meal. Not more than half a pint of fluid should be drunk, preferably in sips at the close of each meal, with two cups of weak China tea unaccompanied by food in the afternoon, and half a pint of hot water first thing in the morning and last thing at night.

Where it is necessary to economise time in the middle of the day, lunch may be made to consist of a milk pudding with some stewed fruit, and then a typical English dinner of soup, fish, joint, sweets, bread, cheese, and dessert may be indulged in not later than 7 P.M. It will be noted that the detailed menu provides for midday dinner with one item of animal food, whilst supper contains the other. This is intended for those who have leisure to spare for the digestion of such a meal, but those who are not compelled to use their muscles much would be well advised to exclude the animal food in the evening, or at least substitute an egg.

Many persons over middle age will find that they are incapable of eating even as much as is mentioned in the specimen dietary, whereas younger men, especially those who indulge freely in exercise, may be able safely to eat quite twice as much. If consistent over-eating be eschewed at all times, and all sources of toxæmia be eliminated, then such misadventures as a gouty old age, rheumatism, and so-called "chill" on the liver need never be experienced.

FOOD FADS OF VARIOUS KINDS

It will be observed that in my endeavour to reply to the simple question of "What must I eat?" I have ahhered closely to the conventional system of mixed feeding practised in this and most civilised countries. This must not be taken as an indication that I have no sympathy with those who for one reason or another consider it advisable to restrict themselves to some other system. On the contrary, I am satisfied that it is not only perfectly possible to live on a system which includes no flesh food whatever, but that many people will find it advantageous so to do.

But a simple question demands a simple answer, although the resources of our language are so infinite that simplicity in rejoinder is the exception and not the rule. Nor could it be very well otherwise unless the conditions were specifically defined, for there are at present more than a dozen systems of diet before the public, each one claiming to be the only infallible way to perfect health. Yet no two are in perfect agreement, and most of them are hopelessly at variance with one another.

The vegetarian demands that nothing be eaten but products of the vegetable kingdom, although he recognises with some degree of reluctance that the ovo-lacto-vegetarians must be admitted into the fold, while the latter sect is broad-minded enough to view with favour the man who adds the flesh of fish—a cold-blooded animal—to his menu.

The low-protein advocate has no special predilections on the question of quality, but rigidly restricts the quantity of his proteins, whether animal or vegetable, *i.e.* fish, flesh, fowl, milk, eggs, cheese, peas, beans, or lentils, and does not despise a good cigar or even a glass of wine.

The uric-acid-free dietist, on the other hand, views with horror fish, flesh, fowl, peas, beans, and lentils, tea, coffee, cocoa, meat-soups, beef-teas, and gravies, and regards with grave suspicion sundry other foods supposed to contain uric acid, *e.g.* oatmeal and wholemeal bread, asparagus, and mushrooms, on the plea that all those substances because of their content of uric acid are rank poisons to the body. Yet he eats very considerable quantities of starchy and fatty foods, which are largely proscribed by the individual who favours the doctrine of hyper-pyræmia which suggests that most diseases are the outcome of even a very small modicum of these energy-producing foods.

Milk might easily be held to be above suspicion as the primary and elemental food of all mankind and many of the lower animals, but the amount of lime it contains is considered dangerous by a small sect which, for somewhat similar reasons, is closely allied to the salt-free cranks. This last sect not only never adds salt to its food, but even places its ban upon perfectly wholesome foods containing a little common salt, and thus places itself in opposition to those who use sea water as a cure for most of the ills that flesh is heir to. The mention of water directs our attention to those who never drink a drop of fluid at any of their meals, and little, if any, at other times.

Yeast is looked upon with abhorrence by many who do not otherwise object to cooked food, whilst the "raw-fooders" profess to eat food in an unfired condition, although they do not despise the thermal rays emanating from electricity as a means of making this food more attractive. The curdled-milk cult has all but died a natural death, although "chewers" are still to the fore, but the no-breakfast plan has recently retired in favour of the fasting fad, which only requires steady perseverance to exterminate all who disagree with any of the methods already mentioned.

Is it any wonder that the plain man, the man who asks a straight question and expects a straight answer, should be left stranded on the verge of despair? He is hardly in better case than the would-be religious devotee in search of the correct sect amongst the more than two hundred religious bodies in this country. And yet he does not cease to eat any more than the wise man ceases to worship, although he, at any rate, has solved his problem by recognising the common ground which is sacred to all the religious sects, that "actions speak louder than words."

Is it possible to find an underlying principle of action which might be applied in the case of diet of such universal application that no simple member of any of the sects can with any degree of assurance find it in his heart to object to it? The reply to this question is of course conditional on the querist being a fairly healthy individual, and not suffering from any gross form of disease, as, for instance, diabetes, which requires a special form of dieting. The answer to the question, therefore, is that the healthy man can live on any system of diet by attention to moderation and regularity, but the unhealthy man must look to the dietetic expert—not the dietetic faddist—to guide him in the selection of the best system or kind of foods to suit his individual case. All old men attribute their longevity to great moderation in diet, and especially to a minimum allowance of flesh food, the great stimulating properties of which are not sufficiently recognised.

The one thing upon which all these sects agree is the diminished amount of food, and so the only conception which appears to unite them is the fundamental doctrine of moderation, which has not only been taught from time immemorial, but is actually practised by all sensible men at the present time. In this connection Abernethy's famous prescription to "live on sixpence a day and earn it"—by muscular exercise, I presume—may be recalled. His original advice to a wealthy patient suffering from indigestion was to steal a horse, so that the incarceration which would be the outcome of this exploit would compel a parsimonious regimen and diet. Cyrus, the creator of the Persian Empire, subsisted from early childhood on the simplest and plainest diet of vegetable food and water, whilst his soldiers adhered to the same rigorous fare. Edison tells us that for two months he lived on 12 ounces of food per day, taking absolutely no exercise and retaining his weight of 185 lb. Sydney Smith, who in the evening of his days confessed to suffering from "seven distinct diseases," was a victim of over-eating, and declared that he "never saw any gentleman who ate and drank as little as was reasonable."

One must therefore select the system which pleases and suits him best, practise it with the greatest moderation, and he need have no qualms of conscience that the nutrition of his body will suffer in any serious degree.

Idiosyncrasy in Diet.—It would hardly be fair to devote much more time or space to this object, especially as I have dealt with it most exhaustively [1] elsewhere, but, from their popularity and importance, one or two of the systems demand a little more consideration. I am specially thinking of vegetarianism, and the "uric-acid-free" diet so-called, but before referring to them more particularly it will be profitable to direct our attention to a question which may very well in some measure be the explanation of their existence, viz. idiosyncrasy in diet.

Doubtless this is also the origin of the expression that one man's food is another man's poison. We are all acquainted with people who dare not eat oysters, crabs, shell-fish, strawberries, raspberries, or other fruits, without producing nettlerash. It is less usual, however, to find that honey is provocative of vomiting and diarrhœa, but I number among my patients one case of the kind, and many such are on record. Some people indeed are so susceptible to its action, that even a small poultice of honey on the skin will produce these untoward effects.

There is a well-known case of a Spaniard who could not eat meat without vomiting, a woman in whom nutmeg always produced the same effect, and there are many people who cannot taste the least scrap of sugar on account of the violent sickness following its use. Haen always had convulsions after eating half a dozen strawberries, and Gould mentions a family in whom the male members exhibit symptoms of poisoning after eating the same fruit, while, strange to say, the female members are exempt. A little boy of this family was killed by eating a single strawberry.

A case is recorded of a woman in whom vinegar—a gentle styptic—always produced hæmorrhage, of a man who always vomited after drinking coffee, and another in whom the slightest dose of manna had a similar effect.

Julia, the wife of Frederick, King of Naples, had such an aversion to meat that she could not carry it to her mouth without fainting, and the anatomist Gavard was unable to eat apples without convulsions and vomiting. Almonds often produce a scarlet rash on the face.

[1] See *Modern Theories of Diet*, by Alexander Bryce.

Of all foods, perhaps the one which most frequently gives rise to trouble is the egg. Swelling of the lips, purple spots on the face, vomiting, syncope, and many other alarming symptoms are described by medical writers as following the ingestion of an egg. Sir Morell Mackenzie gave a striking example of idiosyncrasy to eggs transmitted through four generations. The case is far too long to quote in all its details, but was remarkable in that even although the egg was put into coffee, quite unknown to the partaker thereof, it was followed by the most remarkable symptoms. The eye was swollen and wild, the face crimson, the throat contracted and painful — the whole appearance approximating closely to that observed in apoplexy.

Hutchinson speaks of an M.P. who dared not take parsley because sickness and pain in the abdomen, swelling of the tongue and lips, and blueness of the face always supervened quickly thereafter.

Another man could not eat rice in any shape or form without extreme distress, spasmodic asthma being the most violent symptom. On one occasion he took lunch with a friend in chambers, only partaking of bread, cheese, and a little beer. Shortly thereafter he was seized with the usual symptoms of rice poisoning, and it was then discovered that a few grains of rice had been put into each bottle of beer for the purpose of exciting a secondary fermentation.

Figs sometimes cause the most unpleasant itching of the mouth and throat, and split peas have been known to cause the same phenomena in addition to exciting a running of the nose and eyes. Nettle-rash has often been excited by eating veal, whilst chocolate in any form always produced sneezing in another case. "Raw-fooders" will doubtless stand aghast at the suggestion of uncooked fruit producing asthma in the case of a lady, cooked fruit inciting no deleterious effects whatever.

The most remarkable case of food idiosyncrasy known to science, however, is that of David Waller, who lived about the year 1780. To him wheaten flour in any form proved to be a noxious poison. He was accustomed to say that of two equal quantities of tartar emetic and flour, although the dose of the former did not exceed that usually prescribed by a medical man, he would much prefer to swallow the tartar emetic than the flour. In two minutes or thereby after partaking of the flour in any form he would have been attacked by a painful itching all over the body, accompanied by violent colic and sickness and continuous vomiting ten times as distressing as that occasioned by tartar emetic. In about ten minutes the itching would be greatly intensified, spreading over the whole surface of his body, continuing for two days with intolerable violence, and lasting for ten days in all. During the last seven days of this period his lungs were seriously affected, he coughed and expectorated vast quantities of phlegm, and really resembled a patient in the last stage of consumption. The odour of wheat sufficed to produce the same distressing symptoms, though in a lesser degree, and for this reason he was in the habit of carrying camphor in his pocket, and as an additional safeguard he practised snuffing. It was only in this manner that life was at all tolerable and he was able to escape from the disastrous effects of the practically ubiquitous wheat.

SUSPICIOUS FOODS AND POPULAR BEVERAGES

Suspicious or Deleterious Foods.—It would be quite easy to supplement our list of cases exhibiting marked idiosyncrasy to one or other kind of food, but enough has been said to serve our purpose. It is judicious, however, to look with some degree of suspicion on certain foods and food substances; and to make diligent inquirics as to their source.

For some reason, not altogether explained by Metchnikoff's theory of microbes on their exterior or poisonous fertilisers in their interior, fruits of various classes head the list. Bananas, cherries, melons, prunes, raspberries, oranges, grape-fruit, peaches, plums, apricots, and apples may all in their turn give rise to poisonous symptoms.

Amongst vegetables, in addition to those already mentioned, potatoes, turnips, radishes, onions, cabbage, sage, spinach, and asparagus have been known to excite gastro-intestinal irritation; and onions and spinach, on account of their irritant properties, are frequently used as laxatives by certain individuals.

Oysters, even when not contaminated with typhoid germs, lobsters, crabs salmon, cockles, and mussels are deservedly classed amongst the indigestibles by large numbers of people, and all excepting salmon are negligible sources of food supply. Like mushrooms they should only be looked upon in the light of flavouring agents.

Cheese may contain tyrotoxicon, a poisonous product with effects like cholera, and beans always contain an irritant principle which can only be extracted from them by most careful soaking.

In countries where rye is a staple article of diet, epidemics of a deadly nervous disorder called ergotism, due to the growth of the fungus ergot on the rye plant, are not unknown. Lathyrism is another disease, usually however confined to animals, caused by the consumption of a plant allied to the bean and containing a bitter toxic principle. We have already mentioned the incidence of beri-beri in rice-feeders; and pellagra, which is now endemic in the United States, is attributed to the consumption of maize.

Nuts of all kinds, but especially peanuts and walnuts, possess, in their kernels or the thin skin covering the kernel, an irritating substance which gives rise to severe colic in many people, and is quite unable to be tolerated by others.

The eating of flesh is regarded with extreme horror by vegetarians chiefly because of its tendency to originate disease in the body of the consumer, but in this country at any rate there is less evidence of its capacity to communicate disease directly, than there is amongst fleshless food substances. It is true that epidemics of trichinosis were until recently fairly common in Germany, due to eating "measley" pork, but the few cases recorded in this country in the last half-century have all been imported from abroad. The allegation that cancer, rheumatism, and other diseases are attributable to flesh consumption is disproved by careful investigation.

Popular Beverages.—Well may the wise man pray, "Feed me with food convenient for me," for it is fairly safe to say that no single article of diet has emerged scathless from the critical survey of the dietetic reformer or his antagonist. We may even extend this indictment to the various fluids which the ingenuity of mankind has devised for quenching its thirst. However vigorously the scientist may promulgate the view that alcohol is strictly speaking a food, there can no longer be any doubt that it is in reality a tissue poison of the first order, which manifests its narcotising and finally degenerative action chiefly on the nervous system. It has indeed no claim to be termed a stimulant, being in plain terms only a drug with a temporary exhilarating effect followed thereafter by a long period of depression. The conclusion of practically all thoughtful medical men is that it is quite unnecessary in health, and if not of doubtful value in the treatment of disease, is at least capable of being replaced in most instances by less dangerous substances.

The virulent antipathy displayed by fanatical temperance reformers by reason of its use as a beverage or even as a medicine is quite misplaced, if they are themselves devotees of the "cup that cheers yet not inebriates." For tea, coffee, and cocoa all owe their undoubtedly stimulating and refreshing effects to their contained active principle, viz. caffeine, or one of its allies, a drug which can be procured from any chemist's shop and is to be found on the shelves of every dispensing physician. When used in moderation the valuable stimulating effects of each of these beverages is unquestionable, although it is undoubted that just as a certain percentage of the population is poisoned by the smallest quantity of alcohol, many people display a decided idiosyncrasy for tea, coffee, or cocoa. Some indeed exhibit a condition of chronic intoxication manifested by palpitation, breathlessness, nervousness, headache, indigestion, and in particular neuralgia and mental and physical depression.

It is sheer nonsense to state that a stimulating effect can be produced without a corresponding period of after depression, for action in this respect is always equal to the reaction produced, and it is certain that the injudicious use of any of these beverages is liable to be followed by the development of a craving no whit less tolerable than that for alcohol. This can be quite easily demonstrated, in an ordinary tea or coffee drinker at any rate, by ceasing to partake for a day or two, when the genesis of an unbearable headache will not fail to convince him that he has been under the influence of a drug. At least if it should do so, he need only resume his accustomed potations, when his headache will vanish like magic, and proclaim aloud that he has been cured by "a hair of the dog which bit him."

It is quite certain, however, that in the average person the use of tea, coffee, or cocoa may be continued in moderation for a lifetime without inducing any degenerative effect on the nervous system, at any rate of a character analogous or comparable with that so well known to follow even the moderate use of alcohol.

VEGETARIANISM

We can now apply ourselves with some degree of confidence to a brief consideration of some of the problems associated with vegetarianism. It may be said at once that it has now been established beyond the possibility of doubt that many people in this and every country of the world can safely and with advantage abstain from flesh foods in every form. This is, however, a very different thing from saying that the ordinary mixed diet of this and every civilised country in the world is disease-producing and dangerous to a degree, and that the only rational, and indeed the natural, diet of man is that which can be obtained without circumventing the death of any animal.

This is unquestionably the proposition which was enunciated when first the propagandism was mooted. There have probably indeed existed in all ages of the world's history, as there exist to-day, whole communities and nations which have contrived to live without animal food of any kind, but in the main these people solved their dietetic problem very much as civilised people have done, viz. by evolution and experience. This is essentially different to the attitude of the classical vegetarian who, not content with having discovered the diet which has peculiar virtues in his own case, stoutly asseverates that because it suits him, it must therefore, and for a similar reason, suit every other person. Unquestionably his position would be incontestable were he able to demonstrate that in any particular respect his diet was superior to the mixed one. If, for instance, he could prove that it produced less disease, was more conducive to longevity, more agreeable, or more economical, built up more powerful bodies, or contained less poison-producing substances than a diet containing flesh food, then he would have powerful reasons for his contention that a fleshless regimen is the only suitable and correct one.

It has been my privilege to be closely associated with vegetarians for many years, and I have hence been able to make a most careful investigation into their claims, but I am bound to admit I have not yet been satisfied that in any of the points abovementioned they have been able to establish their position on a firm basis. On those points which are merely matters of opinion they have a perfect right to their own views, but where they appeal to science or experience they must not be offended if one is able to bring forward evidence which clearly refutes their arguments.

So far as I have been able to judge, there is no irrefutable argument in favour of adopting a fleshless diet excepting that of its suitability for the individual, and with this I have no quarrel. I have the highest respect for the man who having adopted a vegetarian diet is able to build up a strong and powerful body therefrom, and he himself is in possession of an absolutely infallible argument in favour of vegetarianism in his own body. I am perfectly satisfied that many such individuals exist in this and other countries, because we have indisputable evidence of their prowess in the athletic world, in the business world, and in the domain of literature. I am equally satisfied that many who now adhere to the mixed diet would be infinitely improved in health and vigour were they to adopt a reasonable fleshless regimen. But I cannot agree with the statement of those who assert that it would be advantageous for all to adopt a fleshless diet, because my experience of vegetarians of all classes has not convinced me that they are stronger, healthier, longer lived, better tempered, or in any degree better than the average mixed feeder, who makes moderation and regularity the watchwords of his whole life.

I would earnestly counsel any who may be desirous of experimenting with a fleshless regimen to reject without hesitation the suggestion that they should restrict themselves to a pure vegetarian system. In India it has been abundantly proved that "pure vegetarianism as practised by the Bengalis and Beharis was totally unsuited to their nutritive requirements, detrimental to their health, annihilated every spark of ambitious desire, and degraded huge masses of the people almost to the level of the brutes."[1] This is the observation of one whose investigations were made with a view to discovering the most suitable diet for the prisoners confined in Bengal gaols.

I am quite prepared to admit that given a careful and proper selection of food, with careful and appropriate preparation thereof, it is possible to attain a degree of health and vigour quite up to the average. But amongst the pure vegetarians, or fruitarians as they are called in this country, such a result is exceptional, and in too many instances disastrous consequences ensue upon an attempt to live on such a regimen.

It is quite otherwise, however, with those who are not averse to the admission of animal protein in the shape of eggs and milk and its products into their diet. I am personally acquainted with many who have adopted such a regimen, and I frankly confess that in the main their health and vigour is quite up to that of the average mixed feeder, although, except in a few isolated cases, they are not conspicuous for vitality, "energy" in the fullest sense of the word, initiative, or outstanding merit in the ordinary affairs of life. I hope I may not be misunderstood in this connection, for I have every reason to be grateful to many amongst the ranks of the vegetarians. I confess also that I admire and rather envy them for their ability to live on a fleshless diet, and I suspect this is the outcome of my sympathy with one strong argument in favour of vegetarianism, viz. the "humanitarian" plea.

I deplore the necessity for the killing of animals to obtain their flesh as food, although I am convinced that I am somewhat guilty of sentimentalism in thus proclaiming my sympathy. I feel, however, that I am no whit worse than the lacto-vegetarian, because by including eggs and milk in his diet he has deprived himself of what in my estimation is the most powerful reason for advocating the fleshless regimen. I have no wish to emphasize this anomaly too strongly, for doubtless he consoles himself with the view that in any case his senses are not shocked with painful evidences of the death of the animals which must be sacrificed to gratify his nutritive requirements.

The Uric-Acid-Free Diet.—In his efforts to support his practice by scientific evidence the vegetarian has taken advantage of two theories, neither of which is very suitable for his purpose. Both have originated in quite recent years, and in the first instance, at any rate, had nothing whatever to do with a fleshless diet.

[1] See *Modern Theories of Diet.*

The better known, which is technically called the purin-free diet, owes its inception to a medical man who suffered from violent headaches which could not be prevented by any amount of medication. Determined to uproot them, he began to exclude one article of diet after another from his daily menu, obtaining thereby increasing relief, until he ultimately evolved a highly ingenious and scientific system of dieting which has proved of immense value in the treatment of many disorders. The first offenders deleted from his list were fish, flesh, fowl, tea, coffee, and cocoa, all of which he demonstrated contained a large percentage of uric acid or substances which formed uric acid in their passage through his body. For this reason he was hailed as a deliverer by the vegetarians, and they immediately announced that flesh foods were disease-producing solely on account of their content or uric acid.

Most unfortunately for them, however, further investigations proved that not only peas, beans, lentils, but peanuts, oatmeal, wholemeal bread, asparagus, mushrooms, and other substances likewise contained uric acid or material which in the body is capable of producing uric acid. Despite these further discoveries, however, to this day their chiefest objection to flesh foods is their content of uric acid, conveniently forgetting or else explaining away the fact that their most trusted fleshless foods are equally worthy of indictment. In condonation of this anomalous attitude they advance the statement that careful preparation enables them to deprive vegetable foods of their contained uric acid, whereas by no amount of forethought can the uric acid be expelled from flesh foods.

It is interesting, however, to note that meat-juices, beef-teas, and gravies contain the major proportion of the purins or uric-acid-forming substances in flesh foods, and every cook knows how easy it is to separate them from the solid substance. This is, however, a work of supererogation, because Pavlow the eminent scientist has proved that these very meat-juices are the most digestion-compelling substances in existence. Hence the value of a few mouthfuls of good soup at the beginning of a meal.

From the uric-acid point of view, therefore, the average vegetarian is precisely in the same position as the average mixed feeder. I believe it is quite impossible to discover a perfectly purin-free diet, although it is doubtless easy to construct a daily menu comparatively free from substances likely to manufacture uric acid in the body. I am quite convinced that the uric-acid craze has been overdone. One can hardly open a daily newspaper without finding in its advertisement sheets reference to one or more medicaments calculated to expel all the uric acid from the body. Now apart from the fact that there is only one disease, viz. gout, the origin of which is known to be associated with uric acid, and in which it is judicious to use with extreme caution such substances as sweetbreads, kidneys, and liver, which contain an excess of that substance, uric acid to the extent of twelve or more grains is daily manufactured by the living tissues of every human being. It is conceivable that if this quantity is all that any individual can excrete in one day, the addition of any in the food would be dangerous, and in all probability there may be some susceptible individuals for whom this proposition is true.

But it has been proved that the average man is abundantly capable of clearing out of his body not only all the uric acid he manufactures himself, but all he introduces in his food, and there is not a single iota of evidence to inculpate uric acid as the originator of all diseases. At the same time I must frankly admit that the origin of disease is in some way associated with toxins or poisons which we have been unable to excrete and which we are unable to isolate. I am quite sure, however, that any individual who can excrete all the poisons elaborated by the daily work of his tissues can with impunity swallow any average quantity of uric acid or food containing it.

Auto-intoxication as a Cause of Disease.—This theory is probably older than the one we have just mentioned, but as a causation of chronic disease intestinal auto-intoxication has only come to the front in recent years. To my mind it is certainly a much more feasible explanation of the origin of disease than any other yet advanced, because we are yet so slightly acquainted with the intimate processes at work in the living tissues that we are unable to appreciate it at its full significance.

Briefly the proposition consists in the statement that the undigested portions of our food become a prey to microbes in the intestinal canal, and that highly toxic or poisonous substances are thus formed which are absorbed into the blood, and so act deleteriously on the body. The alimentary canal, we know, is haunted by countless numbers of germs, and it has been computed that at least 128,000,000,000,000 are discharged each day in the fæces. Fortunately for us they are divided into two classes: (1) those which live on the remnants of protein food, the toxins of which are most deadly in character: (2) those which prefer fats and starches, the by-products of which are much less irritating to the body. These rival sets of microbes are continually at war with each other, and the harmless set have no compunction in annihilating their more lethal opponents.

If therefore one provides a sufficient amount of pabulum in the shape of starchy or sugary food, we may expect an excess of these harmless inhabitants of our intestine and a corresponding diminution of those liable to occasion trouble. This is the conception underlying the "curdled" milk treatment, because not only is a large quantity of sugary matter provided in the milk, but the germs themselves are supplied in abundance in the hope that they may establish themselves in the colon and so overcome its dangerous denizens.

On the plea that flesh foods always provide a large surplus of indigestible material from which the microbes of putrefaction may produce toxic substances, one section of the vegetarians not only eschews fish, flesh, and fowl, but also limits the quantity of vegetable protein to very small proportions. It is also claimed that vegetable protein is much less putrefiable than the animal variety, but this is more or less conjectural, and in any case, largely because of its surrounding envelope of cellulose, a greater proportion of it is undigested and unabsorbed than of animal protein.

It may be laid down as a general principle that wherever you provide a supply of food for them, colonies of microbes will establish themselves and flourish in accordance with the quantity and nature of their nutriment. Now there is always a residue of proteins, fats, and carbohydrates in the colon, and we must therefore expect to find different varieties of micro-organisms in the lower bowel, but it is by no means a foregone conclusion that their by-products will produce a malign influence on the body. In any case it is unfair to lay the blame of any such deleterious effect on the by-products of the proteins alone without reference to those of the fats and carbohydrates, for the latter produce many irritating acids which are capable of absorption, and so of becoming problematical factors in the causation of disease in the body.

Doubtless ere this many of my readers are inquiring why, if the facts be as I have stated, every individual is not suffering from disease in some form, and his query is perfectly apt and pertinent. It is to be hoped that the reply will be satisfactory and illuminating. The truth is that Dame Nature recognised this very difficulty from the beginning and laid her plans to obviate it. In the first place the various digestive fluids, and in particular the hydrochloric acid of the gastric juice, are decidedly antiseptic, and consequently antimicrobic, while the lining membrane of the whole alimentary canal not only excretes a healthy mucus which acts as an antidote to the toxins of the micro-organisms, but the living wall itself, so long as it is intact, is an effectual barrier to their access into the blood. Finally, in normal circumstances, and certainly in the healthy individual living and working in the open air, the bowels empty themselves of their poisonous contents frequently and at regular intervals. Where this does not take place there is more chance of absorption, although, strange to say, in fairly severe constipation, probably because of the lack of moisture in the colon, the effects are often apparently less serious than where there is simply an insufficient daily evacuation.

Even when the toxins have been freely absorbed, Nature is not forgetful of her protective functions, for she has in the first place planted the liver with its internal purifying arrangements as a huge destructor to nullify the poisonous emanations of the colon, and the most feasible explanation of "biliousness" is that the liver resents an overplus of work in this direction and violently proclaims her objection. But the upheaval is more than a protest, for it is likewise an effective means of ridding the system of superfluous and probably dangerous material. When for any reason the liver becomes complacent enough to cease its rejection of such material, almost invariably other and more serious conditions arise. For the poison now obtains access to the blood and sets up headache, skin diseases, rheumatism, asthma, or some such malady, although there are special means provided for metabolising the toxins in the thyroid and other ductless glands.

When they are unable to be metabolised then an effort is made to excrete them by the skin, the kidneys, and the lungs, and no doubt many diseases of those organs arise in this manner. The doctrine of intestinal auto-antoxication is thus a fascinating one, and provides an explanation of the onset of disease which is at once simple and satisfying. Needless to say it is not the whole explanation, but it is full of promise of good health for the man who acts upon it by keeping his bowels open, his skin active, and his lungs free and easy by exercise in the open air.

MASTICATION AND MODERATION

I have entered somewhat fully into one or two of the theories associated with the dietetic problem, so as to enable each individual reader to realise for himself the difficulties surrounding the subject, and if possible to aid him in selecting the best diet for himself. I am particularly anxious to emphasize the fact that my references have been entirely connected with the healthy person. In this liberty-loving country there is too frequently manifested a disposition to decide questions which are entirely outside of the individual realm and for which expert knowledge is really essential. I have no quarrel with the healthy man who strikes out a particular dietetic line for himself, and maintains the highest possible vigour of mind and body thereupon. He has solved a most important problem for himself. But where in such manner one succeeds in effecting a satisfactory solution, many drive sheer on to the rocks of disaster.

I would therefore advise everyone who contemplates making any serious change in his diet, a change for example out of harmony with the established diet of the country or district in which he lives, to submit the proposed alterations to his medical attendant, and in the event of his approval to present himself for medical examination at more or less frequent intervals. This warning has no special reference to any one system, for I am acquainted with individuals living on the most diverse systems who are yet able to maintain themselves in perfect health, but because I am convinced that the malign influence of some dietetic systems is so seductive that it would be well to check it before it has attained serious proportions.

It is imperative, however, for the unhealthy individual to make no experiments on his body, but to place himself under the guidance of a medical expert who will enable him to select the best foods or system to suit his diseased condition.

A reference to the day's menu which I have already detailed will prove that I adhere to the orthodox arrangements of the meals usually observed in this country. The stomach requires something over four hours after breakfast and something over five hours after a substantial mid-day meal to empty itself, and to load it with food at any shorter interval or to do violence to the body by fixing any much longer interval is likely to lead to trouble. Still it is a very complacent organ, in witness whereof one has only to reflect upon the five or six daily opportunities for the more or less serious ingestion of food in a hydropathic, and the six or seven similar opportunities on a transatlantic liner. I confess I have been filled with amazement at the impunity with which people can, on occasion if not regularly, abrogate all the dietetic laws of health, at least as far as the occurrence of serious indigestion is concerned, though doubtless the demon of obesity or excessive thinness, of gout, rheumatism, or constipation, patiently waits at their elbow to take possession when opportunity serves.

For such individuals the problem of careful mastication does not exist, and if they have ever heard of the famous Horace Fletcher, they have quietly ignored his teaching and consigned his practice to oblivion. Their mission on earth may not be precisely that of living to eat, but on the other hand they are entirely ignorant of, or prepared to despise, those who only eat to live. Eating is a pleasure, and in this pleasure-loving and seeking age the pleasures of the table are not forgotten. Happy the man who can afford to swallow his food after a few perfunctory movements of his jaws, the best evidence of his eupeptic condition. Still happier the man, however, who having recognised his tendency to dyspepsia faithfully chews every bite until at least all the solid elements it contains are reduced to such a state that they can be swallowed with every certainty of digestion. Even if the number of chews should approach the three or four hundred for each bite, I am not inclined to hold him up to public derision, for I can promise him relief for his indigestion and ultimately permanent cure, if he will only persevere.

I must not trespass on my space in connection with this great subject, often called "Fletcherism," further than to indicate that there is every reason to believe, from scientific evidence of the highest character, that the nutritive requirements of the body are distinctly diminished by the practice of careful mastication. From every point of view, therefore, it is true economy to encourage it, for apart from the financial reason involved, it is judicious to prevent the expenditure of needless energy in the body. Every particle of food beyond what is actually required for the repair of the tissues and the supply of requisite energy is not only superfluous, but involves a loss of energy in digesting and excreting it. Huge eaters are not therefore necessarily nor usually the best workers, for experience proves that the man who settles down to his regular daily occupation soon recognises that to be efficient he must limit his consumption of food. Only during a well-earned holiday can he afford to indulge his appetite, and that for a very restricted period. On all hands it is admitted that longevity is rarely attained by the excessive feeder, whereas good health and great age are perfectly consistent with the consumption of a very moderate amount of food.

It is quite in the nature of things for my readers to desire some information on what precisely constitutes moderation, and I must confess that this is a question not easily answered. A rough-and-ready guide is found in the suggestion that one should never rise from the table with the appetite completely satisfied, but this of course presupposes a hearty appetite and a healthy condition of mind and body. At the same time it must be admitted that there is much truth in the statement, for the appetite, properly interpreted, is Nature's method of estimating the nutritive requirements of the body, and never fails the man who has honestly earned it.

It is difficult to say just how far it is legitimate to institute measures for tempting the appetite, as it is called. Everything which would contribute to rendering plain food plainly cooked more attractive, such as scrupulous cleanliness, table decorations, beautiful flowers and congenial company, should be welcomed, but the addition of complicated dishes and sauces, entrées, condiments, alcoholic liquor and liqueurs, is sure to lead to a violation of the law of moderation.

The secret of good health and long life is to be found in eating a sufficiency of food at regular intervals, in engaging in a regular but not too laborious daily occupation, in keeping the body clean and the mind cheerful, in having sufficient rest and recreation, and in making moderation in all things the watchword of the whole life.

The reader who wishes to pursue further the study of the Science of Diet may consult the following works:

I. "Food and Dietetics." By Robert Hutchison, M.D. Edward Arnold.

This is by far and away the best book on diet published in this or, at any rate, any English-speaking country. It is full without being encyclopædic, and scientific without being so technical that the lay reader cannot understand it. There is hardly any aspect of the subject which does not receive attention, and in addition the book is eminently practical.

Other books of a similar character and about the same size dealing with the whole subject, but placing more emphasis on different aspects, are:

Diet and Dietetics. Translated from the French of A. Gautier. Constable.
Dietotherapy and Food in Health. Davies. Rebman.
Practical Dietetics. W. Gilman Thompson

II. "Modern Theories of Diet." By Alexander Bryce, M.D. Edward Arnold.

It is difficult to estimate the value of one's own production, but in this book I deal with practically all the important systems of diet which are entitled to serious consideration, and some which my readers may think might safely be ignored. It is the only book of moderate compass in which both facts and theories are placed in array so that they may be contrasted for practical purposes. The first two chapters should be passed over on the first reading by all but advanced students.

For special treatment of the theories, see:

(1) *A Fleshless Diet.* Buttner. F. A. Stokes and Co.
(2) *The Nutrition of Man.* Russell H. Chittenden. Heinemann.
(3) *Uric Acid in the Causation of Disease.* Alexander Haig, M.D. Churchill.
(4) *The Food Factor in Disease.* Francis Hare, M.D. Longmans, Green & Co.
(5) *Le Rôl du Sel en Pathologie et en Therapie.* Achard.
(6) *Natural Hygiene.* Lahmann. Sonnenschein.
(7) *The A.B.—Z of our own Nutrition.* Horace Fletcher. B. F. Stevens & Brown.
(8) *Intestinal Auto-intoxication.* A. Combe. Rebman.
(9) *The Prolongation of Life.* E. Metchnikoff.
(10) *No-Breakfast Plan and the Fasting Cure.* Dr. E. H. Dewey. Fowler.

(11) *Sun-cooked Foods.* Eugene Christian.
(12) *The Penny Guide to Fruitarian Diet and Cookery.* J. Oldfield, M.D.
(13) *The Herald of Health.* C. L. A. Wallace. June 1903.
(14) *Inanition and Fattening Cures.* C. von Noorden. Rebman.
(15) *Fasting, Vitality, and Nutrition.* H. Carrington. Rebman.
(16) *Anomalies and Curiosities of Medicine.* Gould and Pyle. W. B. Saunders & Co.

III. "The Laws of Life and Health." Alexander Bryce, M.D. Melrose. (Popular edition.)

As eating and drinking are amongst the fundamental laws of health, and as it is of vital importance to know the relative value of each law of health, a careful study of this book is strongly recommended.

Alexander Bryce, M.D., D.P.H.(Camb.).

THE TEETH

INTRODUCTION

The human body with all its complex parts gives scope for a long series of special studies; every part is of importance, and we are so made that one part cannot say to another, "I have no need of thee." Many of these studies are matters for medical men almost exclusively; the ordinary layman can go about his daily business happily unconscious of all the possible complications which might arise from a disturbance of any one of his organs, and if he has fair health, to all intents unconscious of their existence. If, however, a disturbance of his health does occur and he has to put himself under treatment, any knowledge he may possess is generally just sufficient, if it is real knowledge, to enable him to realise the importance of having expert advice, and following it, in the early stages of the trouble, lest worse befall him.

The teeth and the care of them is the subject of a very extensive literature, one of the series referred to. It is written for the instruction, guidance, and use of those who make that department of the healing art their speciality; and is not very comprehensible and certainly not very interesting to the average person.

This article does not belong to that class at all; it is written, not for the doctor nor for the specialist, but for the general public, for those who have only their own, or perhaps their children's teeth, to care for, and who, so far from making it a special study, make it barely an incident in the busy current of their lives. It does not profess to state original theories, or to adequately discuss abstruse problems; but merely to give facts interesting and valuable to those for whom it is written.

There are two chief reasons for its appearance; first the importance of the subject in itself, both from the point of view of the health of the individual and the physical well-being of the race, and second, the importance of popular knowledge of the subject. On matters affecting health the last generation has seen a great advance in knowledge and effort. The effect of healthy houses, fresh air, sunlight, proper and sufficient food, exercise and cleanliness are beginning to be realised; sanitation in its widest sense has become one of the chief cares of the community in its corporate capacity; infectious and contagious diseases, though still prevalent, are gradually but surely coming under control; methods of treatment in relation to every ailment are making daily progress. All this has brought about an increase in longevity, the death roll is falling, the casualty list of prematurely killed and wounded in humanity's age-long war with death and disease is being steadily diminished, with a resultant gain to human happiness. While all this is true, there is another aspect of the matter; increasing civilisation has brought with it increasing dangers to health; life is more complex; we live and work more and more indoors; cities increase in size; luxury on the one hand tends to become more elaborate, and poverty to become more sordid. The dangers to health are of such a nature that the need of knowledge and the share of the individual in the protection and maintenance of his own health are greater than ever.

The work of the doctor as a practitioner is to restore to health those who are suffering from some disorder or ailment. The work of the medical faculty is of a much wider nature—it is to prevent people becoming ill, and that work has to be carried out mainly by educating both the individual and the community as to the means to be adopted.

Now the most widespread of all diseases is dental disease; it is serious enough and painful enough in itself, as most of us unfortunately know; justifying to everyone who has had experience, Burns' emphatic outcry, "Thou hell o' a' diseases"; but it is of enormously greater seriousness in its direct and indirect consequences, as I shall later show in some detail. That this is not merely the opinion of a dentist trying to magnify his office, the following words of Professor Osler in the *Lancet* show. He says: "If I were asked to say whether more physical degeneration was produced by alcohol or by defective teeth, I should unhesitatingly say defective teeth."

This, then, is an attempt to carry out in some degree that work of the medical faculty; to give an understanding of what our teeth are, of their function, of the diseases to which they are subject, and how these diseases may be guarded against and dealt with when they occur.

In no department of prevention is the share of each individual greater than in the prevention of dental disease, which in the words of Dr. Sim Wallace:

"Ruins the beauty of many, and enfeebles those who would be otherwise healthy, helps to fill the workhouses and poor infirmaries with preventible sickness, and is the direct and indirect cause of a waste of fabulous sums of money."

THE STRUCTURE AND DEVELOPMENT OF THE TEETH

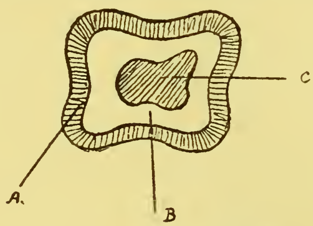
Every living thing, vegetable or animal, is composed of a mass of cells of different number, size, structure, and functions; their nature and arrangement and their co-ordination making up the living creature. And yet each cell may be regarded as a living entity.

It is born of a cell like itself, breathes, assimilates, gets rid of its own waste products, disposes of its own energy, restores its own waste, grows, multiplies and dies. Cells are made of protoplasm, with a reticulate or net-like structure as it is called, enclosing in its meshes a clear or granular substance, having generally a well-defined cell wall. Within are small bodies called nuclei, whose division is the initial stage in the division of the cell into two complete cells, each endowed with the characters and powers of the parent cell. These cells from the nourishment they assimilate build up within themselves, each in its own way, the various structures of the human body and every other living thing.

Some form the bones by building up lime salts. Their combination in groups of untold millions give the separate bones, each in turn with its own shape and part in the solid framework of the body. Others form the nervous system, cells with long fibres growing out from them, communicating with other nerve cells and tissue cells, all meeting and connecting through the cells of the brain and spinal cord, like an enormously complicated electrical system connected to a central generating station. Others again grow into the soft tissues of the body—muscles and all the internal organs. Each selects from the food supplied through the blood and the lymph circulating in all parts of the body the material required to build up the tissue of which it is composed, and brings about the complicated chemical changes which make the transformation from the food into the substance of the cell itself.

Even in a single organ like a tooth the cells which make it up are of different kinds, and grow in different ways.

Teeth are composed of enamel, which covers the crown, or the part of the tooth above the gum; of



Cross Section of a Tooth.
A, enamel; *B*, dentine; *C*, pulp.

dentine, or tooth substance, which makes up the main body of the tooth; cementum, which covers the roots from the edge of the enamel downwards; and a central pulp, containing bloodvessels, nerves, and special cells.

The enamel is formed from a folding in of the surface of the gum, a growth downwards of a fold of epithelial or skin cells.

This fold expands at its lower end into a bell shape, which fits down over a little mound of cells growing up from the deeper tissues and forming the tooth germ. Before it meets this germ the fold of cells or enamel germ gives off a branch or division, which grows down still further and becomes the enamel germ of the second or permanent tooth.

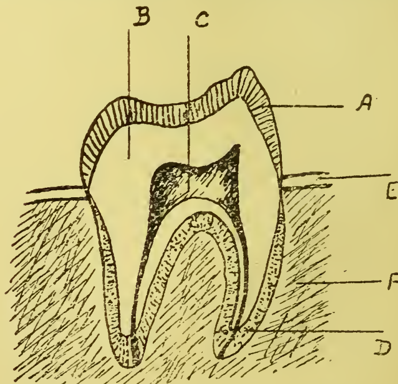
The tooth germ grows until it assumes the shape of the tooth. It becomes enclosed in a sac, and the cells of the enamel germ begin to lay down lime salts at their lower edges, forming a roof of crystalline material over the dentine cells. They work from below upwards, or rather from within outwards, until the whole future crown of the tooth is covered with its coating of enamel.

At the same time the dentine cells are also laying down lime salts. They, however, start from the outside and work inwards. The composition of the latter cells varies markedly from that of the enamel. The lime salts are differently constituted, softer and non-crystalline, instead of forming a solid mass like the prisms of the enamel. The lime is deposited on the outside of each cell, leaving the inner part soft protoplasm communicating with the cell body, and through it with the central pulp of the tooth. The completed dentine cell forms, in fact, a microscopical tube running from the surface to the centre, and the contents of the tube are living protoplasm.

Round this developing tooth is growing the bone of the jaw which encloses it. At a given stage the tooth, of which as yet only the crown is formed, begins to move upwards, makes its way through the bone, covering it, and through the soft tissues of the gum. The whole process of eruption and the forces which cause it are very complicated and obscure. The roots, whose development is little more than begun when a tooth is cut, grow afterwards, and the bony socket which encloses the roots and supports the tooth grows round them. The roots are made, like the body of the tooth, of dentine cells, covered with a layer of cementum, which is composed of cells more like the cells of ordinary bone than those of the other dental tissues. And between the cementum and the socket there is a membrane containing bloodvessels and nerves which nourish both the bone of the alveolus, as we call the sockets, and the cementum of the roots.

The central pulp, during the formation of the dentine, has supplied the material through its bloodvessels, and along with those of the membrane covering the root maintain the living connection between the tooth and the rest of the body.

This brief and imperfect summary of a process, which I am afraid can only be properly understood



Longitudinal Section of a Tooth.
A, enamel; *B*, dentine; *C*, pulp; *D*, cementum; *E*, mucous membrane of gum; *F*, alveolus or bony socket.

by the help of lengthy descriptions and elaborate diagrams, is given here not only because it is desirable that we should know something of the structure of our teeth, but also because several very important practical points in the care of the teeth are brought out by it.

The first is the early age at which care of the teeth may be said to begin. Perfect formation is the first essential for a tooth which is to remain healthy, and the formation of a tooth begins before a child is born, when its health and growth depend on the health of the mother; and so the real beginning of the care of the teeth is the care of the mother. At birth a child has hidden in its tiny jaws the germs of fifty-two teeth, twenty-six in each jaw; of these ten are partly calcified—that is to say, the crowns are complete, or nearly so. By the side of each of these is the germ of the permanent tooth which will succeed it. In addition there are the germs of six permanent molars in each jaw. The depositing of lime salts in the germ of the first of the permanent teeth, the first molar, is just beginning at birth.

Now the growth of the tooth differs very markedly from the growth of other parts of the body. The bones, for example, are first laid down in cartilage, and then harden or are calcified. But always as the child grows the bone cells multiply, and the bone grows with the growth of the child, undergoing continual change and renewal. The teeth, like the bones, are built upon and within a scaffolding of soft tissue, but do not grow with the growth of the body; their first size when cut is the final size, and practically no renewal or repair is possible by natural process. It is true that the walls of the tubes of which the dentine is composed thicken in the course of years, and the tooth substance becomes denser and consequently less liable to decay.

There is also an actual addition to the dentine on the inner surface next to the pulp, making the pulp cavity smaller, and this growth may be increased by certain forms of inflammation due to decay, forming what is called secondary dentine, being an attempt of the tissues to protect the living and sensitive central pulp.

But with that very slight modification the statement that the completed tooth has no power of renewal or repair may be accepted. The enamel, in particular, is quite cut off from the source of its growth, the whole enamel cell, except that part in which the lime crystals were deposited, disappearing on the eruption of the tooth.

The most important years, therefore, in their influence on the development of the teeth are the early years of the child's life, before the teeth are cut. The nourishment of an infant takes a foremost part here. It seems like a truism to state it, but it is necessary to say that Nature cannot here be improved upon. Nor can anything take the place of the mother's milk without disadvantage. Not only does human milk contain everything necessary for the healthy growth of the child, supplying materials for the development of every part; but it does not contain anything to disturb the delicate digestion, and does not give rise to disorders, which react upon the whole system. In addition to that, the child fed at the mother's breast has the bones of the face shaped and moulded, and the chances of the teeth in a well-formed jaw are much better than those irregularly placed and crowded.

If, however, the mother and child are unfortunately deprived of this privilege of feeding and being fed in Nature's way, the best substitute is undoubtedly cow's milk diluted with water to suit the infant's need. Of course there is the great difficulty of making sure that the milk is pure, and that the child is not absorbing infection and disease, instead of health. There is a great deal yet remains to be done before we are all safe from contaminated milk. Inspection of cows, and the removal out of all unhealthy ones; inspection of byres, and reconstruction and draining of the unsanitary and unsatisfactory ones; stringent regulations with regard to the handling of milk in transit and in sale; and finally, care after it comes into the household.

But with all these reservations cow's milk is incomparably better than patent foods. Many of these either contain starchy matter which a child is unable to digest, and which may give rise to digestive troubles, diarrhœa, and perhaps fatal convulsions, or are deficient in fat, and the child is to a certain extent being starved. Professor Cunningham in his evidence before the Interdepartmental Committee on Physical Deterioration, attributed a great deal of the shocking infantile mortality to a want of breast feeding. He said: "They are fed upon skim milk, starchy trash, and all sorts of abominations. It was not that the parents were not able to get better food, but it was owing to the absolute ignorance of the parent of the right kind of food to give."

In addition to the kind of food the method of feeding deserves attention; as early as may be the feeding-bottle even in its best form should be banished, and at the age of three months a child may be taught to drink from a cup or vessel with a long open lip.

Above all, that abomination known as the dummy teat or comforter, should be banned. The continual sucking tends to narrow the arch of the jaws and crowd the teeth, making the front teeth protrude, and thereby preventing their meeting properly with those of the opposing jaw. And it also tends to produce enlarged tonsils and adenoids.

When the child begins to take solid food and the temporary teeth are being cut, the food should be of such a kind that the growing teeth will have something to exercise themselves upon. The instinct of the child to chew everything that comes within its reach is a clear indication that more than pap food is required.

THE ERUPTION OF THE TEETH—TEMPORARY AND PERMANENT SETS

Instead of having teeth which grow in size with the increase of bodily stature, we are supplied with two sets. The first—called variously, the deciduous, temporary, or milk teeth—are twenty in number, ten above and ten below. They make their appearance above the gum, not all together, but in groups in a definite order, at times which vary considerably with the individual, between the ages of six months and the beginning of the third year, the growth of the roots not being complete until between the fourth and sixth years. They differ from the permanent teeth in that they are much smaller; their walls are thinner, the central pulp larger in proportion, and the ends of the roots have a larger opening.

They consist of four incisor or cutting teeth—two central or first incisors, and two lateral or second incisors; two cuspid or canine teeth, miscalled eye teeth—these are tearing teeth; and four molars or grinding teeth in each jaw. The times of their eruption may be given in tabular form, as follows:

	Months after birth.	Usually taking.
[1] Lower central incisors . .	7	1 to 10 weeks
Upper central incisors . .	9	4 to 6 ,,
Upper and lower lateral incisors	12	4 to 6 ,,
First molars	14	1 to 2 months
Canines	18	2 to 3 ,,
Second molars	26	3 to 5 ,,

But these times vary so much that they can only be considered as approximations.

Before dealing with the question of the function or care of the temporary teeth, it might be well to say a few words on the process of teething. In the case of perfectly healthy children it should not, and frequently does not, give rise to any serious disturbance of health. The growth and changes which are then going on are, however, so rapid, that a considerable demand is made upon the nervous and physical frame of the child. How great that demand is may be understood when a case[2] is recorded of a child "who did quite well until the normal time of toothing, when tooth after tooth, irrespective of group, made its appearance, and it gradually lost strength from day to day and from week to week until gradually it sank exhausted."

It is only right, however, to remember that along with this development of the teeth is going on the development of the other organs of the body.

The avoidance of difficult teething depends very largely on the proper and careful feeding and rearing of children in the first six months of their life. I leave for books more directly concerned with the matter the various ailments that may arise at this time, to say a little about the care of the mouth itself.

The primary essential is absolute cleanliness, first of all feeding and drinking vessels, and care in the preparation of food so far as artificial feeding is or has to be resorted to, and second of the mouth itself. The coverings of an infant's mouth are extremely delicate. Teething tends to produce an inflamed condition, and spoiled food may so readily set up digestive troubles and render the state of affairs much more serious, that too great care cannot be taken.

The cleaning of a child's mouth can best be done by wrapping a shred of cotton wool on the point of the forefinger, which of course should be carefully washed. Dip the cotton in sterilised (boiled) water or a saturated solution of boric acid, and go gently and carefully over the mouth, especially between the cheeks and the gum, and under the tongue. When the teeth are cut a camel-hair brush may take the place of the piece of cotton.

Twice a day is sufficient for this cleaning until the child is about three years old, when it may be supplied with a small and soft toothbrush, and be gradually trained to use it for itself. The habit of cleansing the mouth and teeth cannot be too early established. It will require patience and many lessons, and a utilisation of the imitative faculty of children in letting them do what they see the mother doing.

[1] From Morton Smale and Collyer's *Diseases and Injuries of the Teeth.*
[2] Coleman, *Dental Surgery.*

Although teething is frequently a trying time, the dangers need not be exaggerated. The number of deaths from teething has been given as 4·8 per cent. of children under one year, and 7·3 per cent. of children under three years. But the fatal cases rise rapidly in number the lower one goes in the income scale. The children of the poor suffer most, and it is just where the mothers have least chance, both before and after the child is born, and where the child has least of good and suitable food, cleanliness, and fresh air, that teething becomes a critical time, and adds most to the terrible tale of infantile mortality. The deaths are highest of all in foundling hospitals and crowded tenements.

In speaking of the development of the first teeth and that of the other organs that is going on at the same time, it might be well to mention some other parts of the mouth. Mastication is carried on by the tongue and teeth, and its function is to break up the food and to mix it thoroughly with the saliva. The mouth is a cavity formed by the cheeks, lips, tongue, hard and soft palates. Opening into it are three sets of glands, which secrete saliva; these are called the parotid, submaxillary, and sublingual, the first opening in the cheeks, the other two on the floor of the mouth.

Saliva contains chemical substances, which act upon the food and prepare it for the further changes involved in digestion: the most important of these substances is a ferment called ptyalin, which has the special property of changing starch into a certain kind of sugar. The saliva of infants before the teeth are cut does not contain this ferment, and therefore starchy foods, such as bread, biscuits, and even many so-called infant foods are virtually so much poison, and should not be given until a child has teeth enough to chew them.

It is difficult to attach too much value to the temporary teeth. There is almost something slighting in the term. Although somewhat more technical, the more accurate terms, primary dentition and secondary dentition, have a good deal to recommend them for general use. Adequate nourishment is the essential condition of healthy growth. Let us remember that we can only give off energy by the breaking down of the tissues of which we are composed, a literal burning up of ourselves, and that the waste must be restored by nourishment. Now the activities of children are ever so much greater, and are both more general and more continuous than those of adults. Hence, the waste to be restored is by so much the greater.

Then, in addition, the body in every part has to be continuously added to. The life force within cannot build up tissue without food; and in inadequately feeding a child we are asking this impossibility of life. Growth certainly does go on, but into the structure are being built bricks full of flaws, which will crumble and collapse when the stress and strain of life comes upon them, and either the whole edifice collapses, or a part or parts give way with the accompaniment of suffering. Upon the primary dentition depends to a very considerable extent the health of a child at that most important time of its life.

Owing to their structure the primary teeth when attacked by decay are rapidly destroyed, and their important task is imperfectly performed.

In addition to the failure in this particular, decay of the primary teeth causes very severe pain, whose effect upon the yet unstable nervous system of a child is much greater than would be the case in an older person. And yet the primary teeth are more neglected, if that be possible, than their successors. It is natural that in due time they should be lost, but it is neither natural nor necessary that they should decay. Nor is it necessary that if they do begin to decay they should be neglected. Prevention being better than cure, the fact that *clean teeth never decay* must be borne in mind.

Teeth are meant for use, and the more they are used the greater are their chances; therefore give children food that they can chew. The feeding of children on pap food perpetually does more to damage both teeth and digestion than anything else.

Make brushing and cleaning the teeth an engrained habit as early as possible. By the time the child is old enough to do the brushing by itself the habit should have been established by the constant teaching and care of the mother. When the primary teeth first show signs of decay a dentist should be seen. A simple filing can be done without frightening the little patient, and not only is the tooth saved and future pain avoided, but the dentist is first known not as a terrible and horrible man who hurts dreadfully, but as a man who has funny things in his room and is an object of interest and curiosity, though perhaps it is too much to expect that the visit should be a pleasure. There is a world of difference between distaste and horror.

About the sixth year of a child's life the permanent teeth, which have been developing in bony crypts below their predecessors, begin to make their appearance above the gum. The first thing that takes place is the absorption of the roots of the primary teeth, either by the action of the white corpuscles of the blood, or by that of other cells specially developed for that purpose. It seems a strange thing that hard material like the roots of teeth should be literally eaten away, but it is not stranger than many other processes that go on in the body. If the primary tooth has been retained in a healthy condition the absorption of the roots is almost complete, and the primary tooth comes away either of its own accord, in eating or from the pressure of the tongue, or it is removed with a very slight effort. Most people who have children know how simple the process is, very rarely requiring the assistance of a dentist. And when that assistance is requisitioned it is most often in those cases where visits are regularly made to ensure that things are going on all right.

If, however, the primary tooth has decayed, and the pulp has been destroyed, the absorption of the root is often incomplete; or if the permanent tooth comes up in an irregular position the same may happen, and either the tooth or a piece of it may be retained, and prevent its successor taking its proper place.

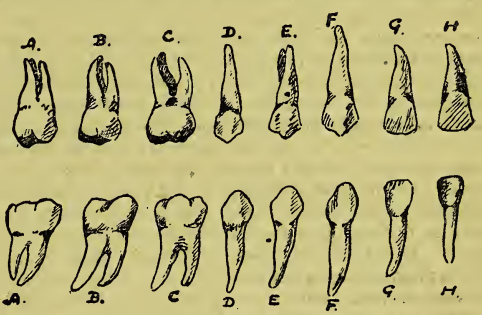
A very small amount of care while the permanent teeth are erupting, and the removal of dead primary teeth or parts of them at the right times, is all that is required to allow the permanent teeth to erupt regularly in most cases. Owing to the position of the crypts in which the crowns of the permanent teeth develop, an apparent irregularity very often shows itself, but when one remembers that the roots of the teeth are not then grown, and that the bony socket in which later they are so firmly set only develops round the tooth, it is easy to understand that, provided there is room for the erupting tooth, the pressure of the lips on the outside and the tongue on the inside quickly bring the tooth into its place.

It is always a good thing, when the parent has any doubt about the position of a tooth, to consult a dentist when it is erupting. It is a case of a stitch in time saving not nine but nine hundred, as the process of regulating may be a very troublesome one later on. The permanent tooth is much larger than the primary; but the child's jaw has been growing in size, chiefly in the length of the horizontal part of it in which the teeth are placed. The main part of this growth takes place behind the primary teeth, thus making room for the extra number of teeth in the permanent set; but it also takes place in the body of the jaw, as can be seen by the gradual separation between the primary teeth before they are replaced.

The normal times for the eruption of the permanent teeth may be given in tabular form as was done for the primary.

First lower molars	6 years
Lower central incisors	7 ,,
Upper central incisors	8 ,,
Upper and lower lateral incisors	9 ,,
First bicuspids, upper and lower	10 ,,
Second bicuspids, upper and lower	11 ,,
Canines	12 ,,
Second molars	12 ,,
Third molars	17–24 ,,

Although the names of the teeth are of no practical importance to the ordinary person, in introducing the name "bicuspid," which has no equivalent among the primary teeth, it might be as well to mention that teeth are described either according to their shape or function. Thus the front teeth are called incisors or cutting teeth. The canine tooth is an obvious reference to shape. The more technical name cuspid also refers to the shape, cusp being, of course, a point. A bicuspid is a tooth with two points, a reference again to shape, while the back teeth are known as molar, which is only a little nearer Latin than the English "miller," the grinder. We do occasionally speak, and quite correctly, of our grinders. Thus the two important parts of the function of the teeth, cutting and grinding of the food, are embodied in names whose



THE PERMANENT TEETH.

A, third molars; *B*, second molars; *C*, first molars; *D*, second bicuspid; *E*, first bicuspid; *F*, canine; *G*, second lateral incisor; *H*, first or central incisor.

apparent technicality is justified, as are many other technical names, by the fact that they are practically alike in all languages where the same subject is technically considered.

A word, too, might here be said about the arrangement of the teeth in the jaw, and the relation of the upper to the lower. The upper front teeth are outside of and a little overlapping the lower, so that they act somewhat like the blades of scissors. In consequence of the upper central incisors being so much broader than the lowers, they overlap the lower central and part of the lower lateral incisor. Thus the remaining teeth have the middle point of their cutting edge over the meeting-point of two other teeth, each tooth articulating or engaging with two teeth on the opposing jaw. The total result is, of course, to distribute pressure, and give larger and more effective grinding or cutting surfaces. It also has this other effect, that the loss of one tooth means that, for working purposes, two opposing teeth are put as nearly as may be on the unemployed list, which is just about as bad for part of a man as it is for a whole man. There is only one other point in connection with the eruption of the permanent teeth, the most important, and therefore kept to the last.

The first permanent molar comes through behind the temporary teeth at the age of six years. It is very often mistaken for a primary tooth and neglected. Now the first molar is a most important tooth for several reasons. It has the largest grinding surface of all the teeth, and is therefore one whose preservation is specially desirable. A reference to the table will show that the next permanent grinding tooth, the first bicuspid, is not cut until four years later, and the next molar till six years later. During those years the first molar has to do the largest share of the work of mastication. Where the primary molars are decayed or lost, it has to do practically the whole work; and even under the most favourable circumstances the primary teeth are being shed, and their successors come into place gradually, and a very great deal depends upon the first molar if mastication is to be properly accomplished. This is the more necessary because not only is a child growing in bodily stature, but its habits are being formed. Decayed first molars make mastication a painful process. Food is bolted instead of being chewed, and the habit once established is continued with disastrous consequences. Care of children's teeth is probably more fruitful in real and permanent results from the age of six onwards, until the permanent teeth are finally erupted and formed, than at any other period of life.

DENTAL DISEASES—THEIR CAUSES AND EFFECTS

Dental diseases, belonging as they do to the extensive class of ailments caused by the action of bacteria, can only be understood if one has a general idea of what these are.

They are minute vegetable organisms, consisting of a single cell visible only through the microscope. They belong to the same natural order as fungi, have no chlorophyll or green colouring matter in their structure, and consequently do not require light for their growth and multiplication. In fact sunlight is one of their most potent destructive agents. They exist in enormous variety, thousands of different kinds being distinguishable by the expert, largely by the way they take up different staining materials. They may either be single round cells (cocci) or grouped in twos or in series like a chain, or again may be long rod-shaped cells (bacilli). They are not by any means all harmful to human or animal life. In fact many of the changes associated with life would be impossible without the action of microbes.

They are divided into two great classes, those which do not produce disease, and those which do; the *saprophytic*, which grow in decaying animals and vegetable matter, and the *pathogenic*, which develop in living animal tissues. These latter by using up the tissues of the body for their nourishment, and by giving off in the body substances which act as poisons, give rise to the various symptoms of disease, each according to their nature, some travelling all through the body in the blood stream, and giving rise to such diseases as fevers; some giving rise to trouble in particular parts of the body; and some like the tubercle bacillus, though not confined in their pernicious action to one part or organ of the body, attack one part, say the lungs, more frequently than any other.

Their growth and multiplication depend on many factors, but under favourable conditions is almost incredibly rapid. They multiply by division of the one parent microbe into two fully-formed daughter cells. The cycle is completed so rapidly that each original invader is represented by millions in a short time. One calculation showed that a single coccus might give rise to sixteen millions in twenty-four hours, and forty-eight million-millions in three days. Such figures are so huge as to be beyond comprehension. The rate of growth, however, varies enormously with the different species, and fortunately, they are extremely sensitive to changes in conditions.

In the body they are attacked by the phagocytes, or white blood corpuscles. They are present in the air, in water, and in food, and make their way into the body occasionally through the skin, but most frequently through the mouth. The chances of their multiplication, so as to produce disease, depends not only on the number of the invaders, but on the resisting power of the individual, the strong and healthy having a much higher resisting power than those of a delicate constitution.

The mouth is an ideal developing chamber for bacteria. They develop most readily in the absence of light and in the presence of warmth, moisture, and some suitable soil. From these considerations it will readily be understood how large a part the mouth plays in the problem of health and sickness.

Practically every kind of pathogenic, that is disease-producing, microbe has been found in the human mouth, and the number of microbes existing in unclean and unhealthy mouths is enormous. Professor Miller, of Berlin, to whom we owe a great deal of our knowledge of the bacteriology of the mouth, calculated that in one extremely unclean case there were present 1140 millions of microbes.

Such mouths are more than a danger to their possessors. They are a source of danger and infection to those they come in contact with. With every breath they are giving off microbes, which may find the weak spot in the armour of any one they meet. It may be said that of all the thousands of neglected mouths the cases where their possessors suffer from active illness are not a large proportion. How do they escape, as so many do ? Several explanations are possible. It may be that the person gradually vaccinates himself with self-prepared vaccine, or that the extremely mixed nature of the cultures of bacteria sets up a struggle for existence among the various forms which prevents the worst results accruing. But the risk is always great, and medical opinion is now attaching more and more importance to the rôle which the condition of the mouth plays in the causation of disease.

So far as the teeth themselves are concerned their decay and destruction begins through chemical action, brought about either by microbes or ferments.

Formed, as has been described, with the exposed crown covered with a dense, polished, and normally impenetrable coating of enamel, they are protected from the direct action of microbes. Their surface affords no nourishment for even the lowest forms of vegetable life. The only part of them possessed of a blood supply, and consequently liable to any inflammatory process, is protected by the whole body of the tooth.

The commonest and most serious disease, and the precursor of nearly all dental troubles, is caries or decay. This never begins from the inside of a tooth and is never the direct and necessary consequence of any other disease or ailment. It begins always on the surface of the tooth, and is preceded by the destruction of part of the enamel.

Strong and dense as it is, the enamel, like all crystalline lime salts, is readily eaten into by acids, and the action of acids is to all intents and purposes the cause of the first step in dental decay.

Now the saliva, which continually bathes the teeth, is, or ought in health to be, slightly alkaline in reaction, that is the opposite of acid. So the danger of decay arises from things put into the mouth ; that is, from food, and not from food itself in the process of eating, but from food allowed to remain in the mouth in contact with the teeth, there to undergo chemical changes brought about by the action of ferments or of microbes.

Particles of food, and more particularly of starchy foods, are forced in between the teeth, into the irregularities on the crowns, or are allowed to remain on some part of the surface.

If not removed by the chewing of some fibrous food, or by the tongue and the saliva, or by washing the mouth and brushing the teeth, the starch of the food undergoes fermentation, changing it into sugar with the formation of acid. The quantity of acid thus formed, although slight, affects the surface of the tooth. Day after day the same process goes on. The surface at first loses its polish. Particles adhere there more readily, and their removal is more difficult. They are retained longer. More acid is formed, and eventually a part of the enamel is eaten through and the tubular substance of the dentine is exposed. If teeth can be kept clean the first stage of decay is prevented, and as the chemical changes are slow, requiring at least some hours, the possibility of securing and maintaining such cleanliness as will prevent fermentation and production of acids is the easier of attainment.

So far the only part which microbes play is in bringing about the decomposition of food ; that is the action of saprophytic microbes, the kind which do not find their support from the living tissues and are not directly the cause of disease. With the exposure of the dentine we have another state of affairs, in so far that the structure of the dentine allows microbes to penetrate the canals, and the protoplasm they contain affords nutriment for pathogenic or disease-producing species. The action of decay, once the dentine of the tooth is exposed, is more rapid than before.

The microbes destroy the protoplasm in the tubes, and they, too, in their growth give off acids which eat away the lime in the walls, forming at first a tough leathery mass, which gradually becomes softer, until it is washed away. The removal of this eventually causes the unsupported and weakened enamel to break down, and a definite cavity is formed, obvious either to sight or to touch.

The serious aspect of caries is that teeth have little power of resistance and none of repair, so that unless dealt with it leads inevitably to further trouble, and eventually to the loss of the tooth.

In the majority of cases it is not accompanied by severe pain, and very often by no pain at all, or only a slight tenderness on the contact of acid or sweet food substances. And yet the cavity is a danger to the general health in so far as it leads to the increase and multiplication in the mouth of dangerous microbes.

Fortunately, however, caries by itself involving no further complications, is quite simple to treat ; all that is required is the removal of the decayed and infected dentine, the shaping of the cavity so that it will retain the filling material, and the replacing of the lost tissue by some suitable substance. If, however, it is neglected further trouble ensues. The decay proceeds until the vascular and sensitive living pulp of the tooth is reached. Now, instead of a cavity in what is chiefly inorganic and slightly sensitive substance, you have an open and infected wound in direct connection with the blood stream.

Inflammation of the pulp is the result, and practically the inevitable result, of its exposure through the action of caries. There is no doubt about its painful character, especially when it takes an acute form. And the consequence usually is the death of the pulp. Being enclosed in a hard bony chamber with only one tiny opening at the apex of each root, through which the bloodvessels and nerves pass, the inflamed pulp swells, presses against the walls of its chamber, and also against the jagged edges of the hole which caries has eaten through, giving rise to intense and severe pain of a shooting or stabbing character, that no one who has experienced it needs to have described. When inflammation occurs in a part of the body through the action of microbes, the body reacts by sending an increased supply of blood to the part. The white cells of the blood attack and consume the invading microbes, and if the infection is not too severe the inflammation subsides. If the microbes overcome in the struggle it leads not only to the death of the white corpuscles, but to the closing of some of the bloodvessels and the death of some part of the tissue and its destruction and discharge in the form of pus. Of course in the case of general infection, it may lead eventually to the destruction and death of the whole organism.

In the case of the tooth pulp the increased blood supply causes swelling. But as there is no room for expansion, except through the hole caused by decay and that where the bloodvessels and nerves pass through, the pressure at the latter point cuts off the blood stream. The supply of white blood corpuscles, the protecting army as it were, is cut off, and the death of the pulp follows, after a painful period whose duration varies.

I will deal with the general effects of this state of affairs later on, and take for granted meantime their evil character.

On the death of the pulp the pain may subside, but the harm is not at an end. Caries is going on even more actively in what remains of the tooth, and destroying its usefulness as a masticating organ. If the pulp dies without giving rise to any immediate extension of the inflammation, the dead pulp putrefies like other dead animal matter. The pulp chamber and root canals are filled with foul-smelling matter, swarming with bacteria and opening into the tissues of the jaw.

The active inflammation may, however, extend beyond the pulp to the lining membrane of the tooth and the socket; the pain alters its character, becoming more continuous and throbbing, the tooth becomes tender to touch, that whole side of the jaw is avoided in chewing, and the neighbouring teeth become fouled, and escape the cleansing effect of mastication. The inflammation is accompanied by the usual general effects, a febrile condition, that is, a rise in temperature and general malaise, varying with the acuteness and extent of the inflammation.

The severity of the pain generally drives the sufferer to seek relief, which may be found either in the removal of the tooth altogether, or its treatment with a view to restoring it to a healthy condition.

In all inflammatory conditions the attack may be either acute or chronic; what has been described is the general course of an acute attack. Frequently enough the process is slower and less painful. The general and eventual consequences are practically the same. The pulp dies and putrefies. The inflammation extends to the socket. Poison is absorbed into the system and discharged into the mouth in smaller quantities over a longer period. The same or greater opportunities are given for the development and absorption of all forms of microbes; the final destruction of the tooth and the loss in power of mastication result as in the former case.

Whether the inflammation be acute or otherwise, when the mischief described has been done, there is a further extension of the trouble common enough, and always probable if the tooth affected is not treated; that is, the inflammation brings about the death of the lining membrane of the tooth. Pus is formed in the socket, the gum swells, and the swelling extends; then the pus burrows through the bone and finds an outlet generally but not necessarily within the mouth. We have what is known as a gumboil, or again to use the more accurate term, an alveolar abscess.

The bursting of an abscess may produce a reduction in the swelling, a diminution or cessation of the pain, but it does not bring about a cure. It only takes on a chronic character, and the pus is discharged into the mouth, swallowed, and absorbed into the system.

This state of affairs may continue for an indefinite time, especially if unaccompanied by further severe pain. Occasionally there may be swellings more or less pronounced, and pain more or less severe, a renewal of the acute condition. But the same neglect, if continued, will lead to a return to the chronic condition. Often enough, but not always, an abscess is the crisis in the series of troubles which follow from dental caries; the pain is unbearable, and relief has to be sought, and is generally found in the extraction of the tooth. It need not, however, be assumed that the loss of the tooth is an absolute necessity. Treatment will often result in a reduction of the inflammation, and if the lining membrane is not destroyed the tooth may still be preserved for a considerable period of usefulness. The possibility of saving the tooth depends on many factors, which the dentist consulted has to consider in each individual case.

The series of ailments just described as a rising out of and following upon dental caries, constitutes by far the commonest and the most serious of dental diseases. There are other affections of the teeth and their associated parts, some not infrequent and others rare, of which a few words may be said.

One takes the form of a chronic inflammation at the edge of the gum surrounding the neck of the tooth, accompanied by a discharge of pus. The gum and the socket gradually recede from the neck, exposing the root, loosening the tooth, and leading to loss, either by its becoming so very loose as to be extremely uncomfortable, or by the inflammation becoming acute, giving rise to considerable pain. Or it may extend down into the socket, giving rise to an alveolar abscess. Although this disease may attack one tooth only it generally affects more than one, and tends to extend to their neighbours. It may attack all the teeth in one jaw, more frequently the lower; or may attack both upper and lower. Technically it is known as Phyorrhea Alveolaris, that is, a running of pus from the alveolus, from its characteristic symptom.

The causes of this disease are somewhat obscure; it is a degenerative inflammation, caused by the inevitable bacteria. It is not possible to say it is due to one certain species, the bacteria associated being those generally found in connection with suppurative processes. It is accompanied by the deposit of tartar, that is the hard lime salts from the saliva, formed much in the same way as lime is formed on the inside of a kettle. This deposits round the neck of the tooth, but while it may aggravate the irritation, and form a rough surface where food may adhere and microbes develop, it is not possible to regard it as the direct cause of the disease. It seems to accompany certain constitutional tendencies such as those of gout and rheumatism. Certain severe fevers may also be predisposing causes.

It leads sometimes, in spite of treatment, to the loss of the tooth, a loss which seems all the more grievous, inasmuch as the tooth appears to be quite good and sound. Of course in reality it is neither good nor sound, since it has lost the necessary and vital membrane that unites the root to the socket—a loss more serious than that of part of the crown by caries.

Treatment of the teeth and gums, though not always successful, is certainly more hopeful the earlier it is undertaken, and even if there is no absolute cure resulting, many years of usefulness may be added to the tooth. In conclusion one might remark, that it is a much more common disease in middle life and later, than in earlier years; and although not by any means confined to those stages of life, it is an affection of adult life, from which youth is to all intents and purposes practically free.

It is hardly necessary to say anything about other conditions which may arise in connection with the teeth; some, such as cysts, due to irregularities in growth and development, others due to poisons, such as lead and phosphorus, common in certain occupations and probably less common now, but still much too prevalent in such occupations as glazing, pottery, dipping matches, &c. Modern factory legislation, the development of machinery, and with certain firms, care given to the teeth and mouths of the employees, have diminished, but not abolished, what may well be regarded as very serious yet decidedly preventable dental diseases. Inflammation may extend from some of the upper teeth to the large air cells lying between the mouth and the floor of the eye, giving rise to suppuration there. That, however, is more correctly included among the possible consequences of dental disease than in the category proper.

There is one other dental disease not yet referred to, of which something must be said—that is neuralgia. A great many people complain of neuralgia who are not suffering from it at all, and so it is necessary to explain what neuralgia is, and to distinguish it from what should properly be called toothache. Pain in or around a tooth is toothache, but the source of the pain may be in one tooth and the pain be felt in another—that is referred pain. Or it may pass from one tooth to another and both seem painful. This referring of pain is very common, and is due to the fact that the nerves of feeling, which pass into the various teeth, all branch off from the same nerve trunk. This referred pain is sometimes spoken of as neuralgia; but it is not. Or, again, there may be pain in several teeth all of which are decayed. Where there is chronic inflammation of the pulp or of the root of the tooth, a cold or any other cause may bring about an acute attack in one or more of the teeth, and all may be painful; while the dentist may be able to say that a given tooth is the source of the present pain. Still pain in and around several teeth is not neuralgia.

Neuralgia proper is pain along the course of a nerve. When it occurs in the course of the nerve which supplies the teeth and the greater part of the face with the sense of feeling, it is called facial neuralgia. Neuralgia, unfortunately, is not confined to one nerve or group of nerves, but may occur along the course of any nerve. The commonest cause of facial neuralgia is irritation from the teeth. The pain which comes in paroxysms is most severe and often unbearable, and as the nerves affect so large a part of the head and neck it may be both extensive and severe, its course depending upon which tooth is the original cause and the extent and severity of the inflammation.

Inflammatory or unhealthy conditions of the gums, or the mucous membrane of the mouth, or of the nose may also be exciting causes. In fact the same conditions in some other organs of the body may, owing to the complex relations of the nerves, give rise to facial neuralgia. It may be caused by the pressure of an erupting lower wisdom tooth upon the nerve in its course, by injuries or pressure from various causes along the course of the nerve, such as any morbid growth. It may have its origin in some affection of the brain. Or it may arise from some general constitutional cause or disease, such as malaria, anæmia, or hysteria, and may be an outcome of overwork or fatigue.

Varying in the degree of its seriousness, it may be cured by the dental surgeon with comparatively little difficulty. It may require prolonged attention from the physician, or its treatment pass into the domain of general surgery, requiring a sufficiently serious operation for its cure. So far as it is directly connected with the teeth and proceeding from them it is more as extending and increasing the pain. It has to be regarded as serious, but the other possibilities are an additional reason against the neglect of dental troubles.

There is a general tendency to regard dental disease as something inevitable and unavoidable. Some people are lucky and escape more or less, others are unlucky. At the same time the consequences that follow from it are underrated. One of the minor ailments, it is allowed to be both painful and troublesome, but, unless when painful and troublesome, a matter that one can afford to neglect. Both of these points of view are hopelessly mistaken. Dental diseases are not inevitable, but preventable, and on the whole easily preventable; that their consequences are of the utmost gravity it will be the purpose of the remainder of this section to show.

The earliest dental diseases are those connected with teething. Even in a normal healthy child the process of teething generally gives rise to a certain amount of discomfort, resulting in restlessness and peevishness; but especially in delicate children those conditions are frequently exaggerated. The slight irritation develops into a decided inflammation, bringing about conditions which cannot be considered as other than serious. A long list of troubles which are the reflex result of teething might be made, covering disturbance of the digestive system, of the nervous system, the respiratory system, and the skin; ranging from restlessness and sleeplessness to convulsions, including diarrhœa, coughs, and painful skin eruption. Even a certain proportion of cases ending in death are noted. It is difficult, in assigning the share of the teething process in such results, to say how far the rapid development of the other organs of the body going on at the same time contribute to the production of a state of unstable equilibrium in a child's health. It may be that the effects of teething have been overrated, and that other factors enter into the bringing about of serious conditions. Even if teething, with its strain and irritation, were regarded only as the spark which brings about an explosion, there is need for all the care which is possible.

The chief point is, of course, the general health of the child. Good food, that is Nature's food, the mother's milk, is the first essential, a sufficiency of fresh air and cleanliness ranking along with it. If inflammation does develop with the cutting of a tooth, the careful cleansing of the mouth, and the use of some soothing application, preferably under medical advice, are called for. It may be necessary to use the lancet to relieve the part, and in all cases special care of the digestive organs to prevent further extension of the trouble is necessary.

Something has already been said, in dealing with the eruption of the milk teeth, of the consequences of neglecting the disease to which they are liable. They are capable of involving such an amount of pain as is in itself a serious matter. The pain passes, but its effects remain. It results in loss of sleep, and that added to the nervous strain which suffering involves, has far-reaching effects upon the nervous system. It is true that the milk teeth have to come out, but it is well to remember the length of time that Nature meant them to last. Compare the two tables given before, and it will be seen that the incisor teeth should last nearly six years; the first and second milk molars and the milk canine have eight, nine, and ten years' work to do before their permanent successors are due to replace them.

Those years during which the temporary teeth have to perform the first act in digestion are the most important years in a child's life. Medical authority states that if a child is ill-nourished during the first five years of its life, no amount of medical care, not the most generous supply of food in later life, will be able to undo the harm already done. The want of masticating power is the first step in semi-starvation; for after all what we call food is only food after it has undergone various chemical changes. All these changes are made easier by the proper breaking up of the food into a pulp by the action of the tongue and teeth in chewing, and the change of starch into sugar, which it is the special function of the saliva to effect, is one of the most important of all.

If the food is not properly chewed it throws upon the later stages of digestion a burden they are not fitted to bear. The larger pieces pass through the body only partly assimilated and partly wasted. And the same is true of starchy foods which have not been acted upon by the saliva. The effects of decay of a temporary tooth are not only that the usefulness of that particular tooth is destroyed, but that its tenderness leads to the disuse of all the teeth on that side of the mouth. The child, who is forming habits, gets into the habit of bolting its food, and even when the cause has disappeared, the habit is continued and carried on into later life, with a result of indigestion and all that may arise out of it, in general physical inefficiency and discomfort.

The idea that the first teeth don't matter, they have to come out anyway, is a very widespread one. A letter received from the parent of a child whose teeth it was proposed to treat, said, "They would be wanting to take off the boy's head next. When he was a boy there was none of that nonsense, and children were a lot healthier then. They were only his first teeth, and they would have to come out anyway."

That parent, I am afraid, speaks for a great many. It may be that a generation ago, and especially in country districts, where life and food were simpler and ample fresh air and exercise the share of all children, that their temporary teeth needed little attention, and if through care and the maintenance of health, a child can do with little or no treatment, so much the better. But at the present day, and more especially in cities, where after all three-fourths of our children are born, and must live, the temporary teeth do decay at a distressingly early age, and neglect of that decay is a thing to be deplored. Children, too, are more liable than adults to infectious diseases. Fever hospitals, if not just exactly children's hospitals, have a large majority of children in their wards. Every child must run more or less continual risk of absorbing, chiefly through the mouth, the microbes which produce the various diseases; and if the teeth have cavities where those not only lodge, but multiply, until they amount to an infective dose, and further pass direct into the tissues and the blood stream through the comparatively wide openings at the end of the root; and if, in addition to that, the system is being poisoned by the absorption of pus and microbes from suppuration and its power of resistance weakened, the risks are multiplied to an incalculable extent.

The toll of child life which the various infectious diseases take might be minimised considerably by proper care of the temporary teeth.

It is desirable in the interests of the second teeth that the first should be retained for the full time. The premature loss of the primary teeth increases the liability to irregularities in the second set. The first permanent molar comes in immediately behind the temporary teeth. If the temporary molars are gone, the tendency is for the permanent molar to erupt too far forward and to encroach upon the space afterwards to be occupied by other teeth. It has to be remembered that teeth do not erupt through a bony socket, which has an existence and a fixed position. The cells above an erupting tooth eat away the tissues above it, and the bony socket, in which the full-grown tooth is so firmly set, grows around the roots which are formed after the tooth makes its appearance above the gum. The crowding which results from premature loss of the primary molars is not easily remedied later. It may involve the loss of a tooth or lead to the decay of several.

Another thing that has to be guarded against is the opposite condition, that of undue retention of the temporary teeth. Especially in cases where decay has been extensive, resulting in the death of the pulp, the roots of the temporary teeth are not absorbed before the movement of its permanent successor, and the descending new tooth is turned out of its course into an irregular position, in which position, if it is allowed to remain, the bone develops round the root, making the irregularity permanent.

Many teeth seem to erupt in an irregular position which are not at all irregular, the action of the lips and the tongue gradually pushing them to their proper place in the arch. But if that proper place is occupied by a temporary tooth that action is not effective unless the obstacle is removed at the proper time.

It would lead to some unnecessary repetition were one to attempt to deal fully with the consequences of dental disease as affecting the temporary teeth separately from the permanent ones. Just enough has been said to give an indication of the importance to be attached to a healthy condition of the former. It is not even an attempt to describe the consequences of dental disease upon children, since decay of the permanent teeth is unfortunately common enough long before childhood is passed, and so in coming to the consideration of the consequences of dental diseases generally, most of what has to be said applies equally to children and those of riper years. In the case of the temporary teeth one has to bear in mind the rapidity of the body's growth and development, and the supreme importance of proper nourishment, the readiness with which health may be disturbed, and the far-reaching effects of such disturbance; while with the permanent teeth, although the bodily frame is a stage or two nearer to maturity and is not so easily injured, on the other hand the loss of teeth, or the loss or limitation of their usefulness, is irreparable so far as natural processes are concerned.

The most extensive evil which accrues from dental disease arises from its effects upon nutrition and the digestive system generally. It goes further than mere interference with mastication, which, as has been shown, overloads with work the other organs of digestion, diminishes the real value of food, and by giving rise to indigestion, opens up indefinite possibilities of harm, whose original cause may quite easily be obscured, or even lost sight of. The worst effects arise naturally from the more serious stages of disease, where septic matter, as the poison of pus and its associated microbes is called, is being absorbed into the system, either by being discharged into the mouth or passed directly into the blood stream, or both. Two results of this may be noticed; in the first place, it directly diminishes the power of resistance to disease; in the second place it destroys appetite, and by interference with nutrition lowers the vitality. A few effects of this septic absorption may be given to show how far-reaching they are. One very common one, and closely associated with dental caries, is enlargement of the glands of the neck; the greater proportion of these are tubercular. In one examination of nearly a thousand children made by Odenthal of Bonn, among whom were 70 per cent. with enlarged glands, 50 per cent. had also carious teeth; and although there were a small proportion who had enlarged glands without having decayed teeth, there was only one half per cent. who had decayed teeth without enlargement of the glands. Of course these figures are not meant to show the usual proportion of enlarged glands among children, but their close association with decayed teeth, and that is made clearer by the addition of the fact that 28 per cent. of the children who had no decayed teeth had also no enlarged glands. I have ignored, in quoting these figures, some fractions in the percentages.

Another very common effect from the absorption of septic poison from the mouth is anæmia. Some medical men declare it to be the commonest cause, and it is becoming general in cases of anæmia to make the first step in treatment the attention to the teeth, to secure that they are all in a healthy condition. A large number of cases of that serious form known as pernicious anæmia, which may have a fatal result, have been traced to infection from the mouth. In fact Dr. W. Hunter declares that the infection in such cases is nearly always from the mouth.

Cases of general debility and loss of weight are common, and closely allied to anæmia. Three cases of lung trouble arising from septic discharge in cases of Phyorrhœa Alveolaris being absorbed are reported by one doctor, which were cured when the mouth was restored to a healthy condition. Closely allied to such effects are those which follow from a direct extension of inflammation in the mouth to other parts. The pus burrows through the tissue, and the abscess opens in some part of the face or neck, and in one case as far away from the original seat of trouble as the armpit. In such cases the danger from general blood-poisoning becomes serious, some of the cases just escaping a fatal conclusion. Again the inflammation may extend to the larger air cell in the bones of the face, which lies between the floor of the eye and the roof of the mouth, and communicates with the nose, a condition requiring surgical assistance and as a rule considerable time for its cure. The presence of decayed teeth with sharp edges and unclean surfaces gives rise to sundry troubles in the cheeks or tongue, even being the provoking cause of the dread disease, cancer.

But the absorption of poison is not the only thing which may produce results more serious than most people might expect. The pain and irritation of toothache may be the source of further trouble. The connection between the teeth and the other organs affected may seem very slight, or even imaginary to the general reader. But to those with a knowledge of the complex and close relationship between the various sets of nerves, the directness of the connection is undoubted, and the results not surprising.

Heart trouble, taking the form of palpitation and marked irregularity, is one effect for which there is the very highest medical authority, and its successful treatment and cure by attention to the teeth is recorded in numbers of cases. Epilepsy, disorders of the ear, disorders and inflammation of the eye, and even pains in the pelvis—the lower part of the trunk—may arise from what is called reflex irritation.

The connection of consumption with dental disease deserves special attention for many reasons; first because that disease is responsible for one death in every seven that takes place in this country. It is now fully recognised to be an infectious disease conveyed from one person to another; and instead of being regarded as an incurable disease it is one that can be treated with the expectation of successful cure if taken in the early stages. Moreover, so impressed is the public opinion with the seriousness of the problem that we are now on the eve of a great national campaign, backed by imperial and local funds, for the overcoming and eventual abolition of the scourge.

The state of the mouth is closely related both to its cause and treatment; to its cause in two ways, decayed teeth being a direct avenue of infection through which the tubercle bacillus may pass, affecting first, in all probability, the glands of the neck, and later extending to other parts of the body. But besides the possibility of bad teeth being a direct means of transmitting infection, their action in reducing the resisting power of the body to any infection is a potent influence for evil. The treatment of tubercular disease, especially of phthisis, or consumption of the lungs, is at present chiefly what is known as the open-air treatment, the fundamental idea of which is that it is a nutritional treatment attempting to restore to the body the power of resistance to and recovery from the attacks of the disease.

To expect the best results from cases where both air and food are passed into the body contaminated by hosts of microbes in their passage through a mouth with bad teeth, or where the absorption of poison from the same source is destroying appetite, is to expect the impossible. Therefore, it is not overstating the case to say that both from the point of view of prevention and cure, the elimination, or at least the diminution and general treatment of dental disease is an important factor, which must not be neglected if success is to attend the campaign against consumption.

This rapid summary of the general question of the consequences of dental disease makes no pretence of being exhaustive. Other evil effects could be enumerated. Enough, however, has been said to justify us in regarding dental disease, the most widespread of all diseases to which human flesh is heir, as a matter of the utmost importance, and its prevention and cure as a task which civilised humanity must undertake if physical degeneration is to be avoided.

THE CARE OF THE TEETH

The care of the teeth naturally divides itself into the two parts—prevention and cure. Broadly speaking, prevention is what can be done for ourselves by ourselves, and the treatment necessary for cure is what is done by the dentist for us when decay has taken place in spite of our precautions, or because no care or insufficient care has been taken. But the two overlap, since treatment has to be resorted to not only to cure the particular breakdown, but to prevent the extension of the trouble in the same tooth, to other teeth, or further troubles in associated parts.

Of these two divisions prevention is incomparably the more important. Consider the extent of the trouble; from 95 to 99 per cent. of the people are more or less affected by dental disease—in the majority of cases more rather than less; if any means of prevention can be found and can be applied, it is better than an army of dentists and the most skilful and scientific treatment.

Effective prevention consists in a removal of the causes which produce disease, and that presupposes a knowledge of what these causes are.

In the first place it had to be decided whether those causes were external to the tooth or depended upon something internal to it, say its structure or condition. Why did some people have extensive and others slight decay? Why did some families all seem to have bad teeth and others good? Why was there in the same mouth at one time rapid decay, and at another period of life little or none? A whole series of problems had to be solved before a satisfactory answer could be given to the question, Why do teeth decay?

Of course no satisfactory answer could be given until the purely modern science of bacteriology arose. Now we know that caries, or decay, is brought about through the action of microbes on the tissues of the teeth. We can also definitely decide that it is not due to the action of one special kind of microbe. There is nothing which corresponds to the action of the tubercle bacillus in relation to phthisis or the coccus associated with pneumonia. Diphtheria, scarlet fever, smallpox, &c. &c., all have associated with them a special microbe, which can be isolated, and pure cultures of it made; and if the infection is transmitted from these cultures the same symptoms and course of disease inevitably follow.

The dental tissues may be attacked by various species of microbes, and those so common of occurrence as to be almost omnipresent. That, however, is only a first step. The next point to settle is, How do they attack and gain access to the tissues of the teeth? We can again say with certainty that microbes have no direct action upon the enamel which covers the whole exposed part of a healthy and well-formed tooth, and cannot of themselves penetrate the enamel. This second step takes us much further.

It enables us, for example, to test such an explanation for the existence of dental decay, that certain people and certain families inherit bad teeth. For teeth to be liable to decay from the direct action of microbes, they must have faulty enamel. Many teeth do have faulty enamel, in the form of pits on the surface and other flaws. But most of these arise from such causes as rickets, malnutrition, scarlet fever, measles, and other diseases acquired while the enamel is forming, or from the administration of such drugs as mercury, at the same period of life. The vast majority of cases of faulty enamel are acquired faults and not hereditary ones.

The inheritance of the shape, size, and arrangement of the teeth in the jaw is obvious enough, and may produce irregularities which predispose to decay, as will be shown later. But speaking generally, the hereditary factor is quite a small one in the production of dental disease. Having then come to the conclusion that microbes cannot directly act upon the enamel and cannot get access to the tooth except through a break in the enamel, we have to seek for the cause of dental decay in something which will destroy the enamel. That something is found in acid, and that acid is produced by the action of microbes upon fermentable carbohydrates, especially starches and sugars.

When now we ask, Why do teeth decay? we are really asking, What conditions produce acids in contact with the teeth? And when we ask how decay is to be prevented, we are seeking for that which will prevent fermentation and the attendant production of acids.

One thing is certain; that is, we cannot exclude microbes from the mouth absolutely, no matter how healthy the individual or how perfect the teeth. Microbes are present in the air, and are to be found on all parts of the body exposed to the air. The mouth, as has been mentioned, with its warmth and its moisture, is the part of the body where it is least possible even to approach the condition called asepsis; that is, the absence of all microbes. It remains, then, to consider the possibility of keeping the mouth clear of fermentable matter, since on that depends the whole possibility of preventing dental decay. It is, of course, equally impossible to exclude fermentable carbohydrates from our list of foods.

Foods are made up of different classes of material. We have proteid or albuminous matter, chiefly provided by such foods as meat, fish, eggs, peas, beans, &c.; fats, supplied in the form of the fat of meat and bacon, butter, cheese, &c.; starches and sugars, which represent the fermentable carbohydrates, are taken in the form of bread, potatoes, rice, sago, and the various kinds of puddings, jams, cakes, and confections. In addition to these we have fruits and vegetables, largely composed of cellulose and water, along with acids and certain kinds of sugar.

Obviously the fermentable carbohydrates are such a large and important part of our food-supply—in fact the largest and most important part—that their exclusion from the mouth is just about as possible as the exclusion of microbes themselves.

Fortunately, neither the exclusion of microbes nor yet of fermentable food-stuffs is a necessary condition for the prevention of dental decay. What is required is a prevention of fermentation by the action of the one upon the other, especially in contact with the teeth, where the acid formed in the process will bring about the first stage of decay. This simply means that food particles must not be allowed to remain in the mouth in contact with the teeth long enough to produce such effects. The whole problem, in short, of the prevention of dental decay, is the problem of how to keep the teeth clean.

This opens up several important and difficult questions, such as the value of artificial methods of cleaning the teeth, the use of the toothbrush and tooth-pastes and powders, and the possibility of keeping the teeth clean by wholly natural means, the choice of food-stuffs, and the order in which they are eaten. There are authorities, such as Dr. Sim Wallace, who pin their faith entirely to such means, and assert that the whole possibility of preventing dental disease is a question of diet, a question of so arranging every meal that the mouth will be left in such a condition that decay is not favoured. Even those who insist on the value of conscious effort, and the use of what may be called artificial methods of cleaning the teeth, do not by any means ignore the other side, and so it will be as well to say something about what can be done to prevent decay without calling in the aid of toothbrushes and powders, before saying anything about the place and use of the latter.

Care of the teeth, to be effective, must begin at the beginning. A great deal depends upon the food of a child at the stage when milk ceases to be sufficient and solids first begin to be supplied. There is a very general tendency, in the attempt to make the transition gradual to feed the child on pap food, bread and milk, and suchlike things—a tendency backed by the authority of the greater part of the medical profession. I cannot do better than quote Dr. Sim Wallace's discussion of the effect of pap-feeding.

"For simplicity attention may be limited to bread soaked in milk, for it illustrates the pap-feeding principle as well as anything else, and it is the most generally recommended food for infants who are beginning to be allowed something solid in addition to milk. Now what happens when an infant hitherto accustomed to milk is given bread well soaked in milk? The first noticeable effect is that the infant gulps down the milk-soaked bread and milk without any attempt at retaining it in the mouth, or mixing it with saliva. The starchy matter in the bread is, therefore, washed into the stomach without any insalivation, without any conversion of the starch, and without any preparation for digestion in the stomach. The physiological effect which the retention and mastication or gnawing of food in the mouth produces is practically lost, and the flow of digestive juices in the stomach is correspondingly lessened.

"The palate is cheated, for large amounts of carbohydrates are washed rapidly past it, and instead of appreciating the large amount of converted starch, or rather of unconverted starch which the child has consumed, it craves for more of that very substance of which it has already consumed too much—in other words, it develops an abnormal craving for sugar. Further, by becoming habituated to swallowing solid food, it soon loses that automatic mechanism which arrests solid food in the mouth till it has become liquefied and prepared for deglutition.

"At a later stage, say about the thirteenth month, when the first temporary molars have taken their position, what happens when the child is restricted to this soft diet? The previous troubles continue, and the teeth get dirty and tender from want of use; later they become carious and the tenderness increases, while for the same reason mastication is not performed, and so these troubles and others resulting therefrom become more or less thoroughly established.

"But it may be asked, Why, then, has the milk-soaked diet been brought into existence? Well, no doubt, it is because milk was considered the most excellent food for children. But it was found that cows' milk, when it was given to children undiluted, formed large clots in the stomach, and thence consequently led to various intestinal troubles. This did not dissuade those in authoritative positions from still advocating undiluted milk. No, they said, soak bread in the milk so that the clots will be broken up. And if there is coughing and spluttering see that it is thoroughly soft and well broken up before the child gets it.

"Now, why should not a hint be taken from Nature? Mothers' milk when the child reaches nine months or a year, does not become more solid, rather the reverse. Suppose we give cows' milk, why should we make it less diluted than it was before, seeing that the time is beginning to approach when the child will and can eat solid food, and drink liquid water? The child has been accustomed for all the months it has existed to have its mother's nipple in its mouth (or an artificial substitute), and from this it has been able to express or suck liquid food. When it is determined to give the child solid food, why not let it get a solid piece into its mouth? In other words, why not let it have a slice of bread, or better, perhaps, toasted bread and butter? No doubt the child feels that toast and butter are not its mother's breast, and it certainly subjects the toast to the influence of its teeth. It gnaws and it sucks it; the gnawing induces a flow of saliva, and the ptyalin converts the starch. The child continues to suck much as it sucked its mother's breast, and its palate appreciates that it is actually sucking liquid out of the solid toast.

"Gradually the toast disappears, practically in the form of liquid, down the child's throat, thoroughly prepared for further digestion in the stomach. Before the fourteenth month, or at least before the temporary molars erupt, true mastication of course is not performed. It is gnawing which is indulged in, and it certainly and instinctively is indulged in by all children. After the child has had its toast to supplement its milk diet, say twice a day for a month or two, then other things may be added, such as rusks and milk puddings made sufficiently solid, and as there is not an excess of albumen in the milk (it having been diluted) boiled fish and chicken may be given in small amounts.

"I have had some little experience with this method of feeding infants, and can say most unhesitatingly that coughing, choking, or spluttering has been conspicuous only for its total absence. And those who have adopted similar methods with children from the beginning have been impressed or even astonished by this fact. But this is not all; the desire for hard food remains. The teeth do not become tender, nor the mouth dirty, nor the teeth carious. The palate is not cheated, and the desire for excess of foods or sweets does not exist. The alimentary canal performs its functions in a natural and healthy manner, and by the age of two and a half, when it has its full set of temporary teeth, the child can and may be allowed to titurate practically any food which adults habitually eat."

Another very important result of thus early establishing the habit of efficient mastication is its effect upon the development of the jaws, the tongue, and the muscles employed.

It has been proved conclusively that the absence of proper mastication leads to imperfect development of the jaws, and in fact of the whole of the bones of the side of the face This in turn leads to irregularity in the position of the teeth.

It has been said that faults of structure are not uncommon; such faults as pits or grooves in the enamel are present [1] in from 4·6 to 7·1 per cent. of permanent teeth, but irregularity of position such as will predispose to decay may rise to as high a proportion as 80 per cent.

If the teeth are to be kept clear of lodged particles of food by either natural or artificial means, or both, then regularity of position is of the first importance. Irregularity is caused for the most part by overcrowding, and overcrowding by imperfect development of the jaws.

In addition, the early establishment of the habit of chewing has a marked effect on the relative position of the teeth—what is called technically occlusion. The putting of the teeth together in the attempt to bite brings them into the proper position, that is, the lower a little behind the upper, like the blades of scissors. The back teeth, too, as they are cut are often dependent on the tongue and lips, as well as the pressure of use, to direct them to the proper position, and the more chewing a child has been trained to do the stronger are the tongue and lips, and the more effective for this purpose.

The teeth should be arranged in a regular arch, the inner surface of which is swept continually by the tongue, and so cleaned; but if by overcrowding irregularities are produced, instead of a regular and practically smooth surface there are angles and corners where food lodges, ferments, and starts decay.

But the influence of diet on the formation and chances of the teeth extends far beyond early childhood, right through life. There are two main points to be considered; first, the nature of the food itself, and second, the order in which it is taken. If the teeth are to have a chance of continued health we must have a sufficiency of firm, fibrous food, which will necessitate vigorous chewing. The effect of this during the whole period up to the twelfth or thirteenth year, when the permanent teeth are coming into place, is a continuation of the same influences which have been described as affecting their temporary predecessors.

The development of the jaws, the position and occlusion—that is, the proper meeting—of the teeth, depend upon their use, as does also the condition of the other tissues of the mouth related to the teeth. The roots, and the bony rocket in which they are set, grow after the tooth is cut. Strength and exercise in this, as in every other part, go together. Well-used teeth are firmly set in the jaw. Even more important is the condition of the gum which surrounds the neck of each tooth. All teeth are wider at the top than they are at the gum edge; it is easy to see why this must be so.

As each tooth is subjected to great pressure its roots are surrounded by a strong, yet somewhat tough and elastic plate of bone, and between each tooth this septum of bone common to two sockets takes up a certain amount of space. Were the tooth at the gum edge as wide as at the point, we would have a space between each tooth equal to the thickness of this bone, into which food would pass, and from which it would be difficult to clear it; instead of this we have each tooth curving outward from the neck, normally meeting the next tooth on either side, and giving a much more effective chewing surface. The space remaining is a small, inverted, V-shaped one, which, since the tooth is a curved surface, affords no great lodgment for foreign particles. This space, however, is not left empty; above the bone, and also in health closely adherent to the tooth, comes the gum, whose surface is not skin, like the outside parts of the body, but mucous membrane as it is called, a surface continually secreting and giving off mucus, imparting to the gum the smoothness and moisture which makes it in effect a lubricated surface. A little mound or papilla of the gum grows up in the space between each two teeth, filling it up with a soft cushion.

Efficient chewing develops the gum, keeps it in a healthy condition, causes it to adhere more closely to the neck of the tooth, and so protects it at its most vulnerable point, the interdental space. Another effect of the use of foods requiring a great deal of mastication, is that they polish and slowly wear smoother the irregularities on the surface both of the front and the back teeth. Everyone who has looked at the newly-cut front teeth of a child will have seen that the cutting edge is not straight and flat, but slightly notched. These notches are always worn down and a straight edge produced. In the crown of the molar teeth there are points and crevices, and the deepest parts of these crevices are the commonest starting-points for decay in these teeth. Not only does the chewing of firm, fibrous food clear those crevices, but in the course of time slightly smooths down the sharper points of the surfaces, rounds the angles of the crevices, and diminishes their depth, thus decreasing the risks of food being retained there.

Let us come now to the second point—the order

[1] Mr. Sydney Stokes.

in which food is taken in our meals. If we begin our meals with the foods that are fibrous, require a good deal of chewing, and are not adherent, and finish with the short, soft foods, which not only turn into a more or less adherent paste, but are more easily forced into crevices, and in addition are from their nature fermentable, giving rise to acid formation and possible decay, we may, while providing sufficient exercise for teeth and jaws, leave the mouth between meals in an unfavourable condition.

Another important point to remember is the influence of chewing upon the flow of saliva. Chewing increases that flow, and saliva is the natural mouthwash. If we finish a meal with soft food the flow of saliva is not provoked; particles which would otherwise be washed from between the teeth or from their surfaces, may remain there. Let us look, then, in a little more detail at the different kinds of foods and their action in the mouth. Take first a typical group of albuminous foods, meat, fish, and fowl; they are made up of long fibres. These are crushed over and over again between the teeth, the pressure exerted being greater than most people would probably credit, say about sixty or seventy pounds. They are very effective in cleaning the teeth, and leaving the mouth in a clean condition. Although the fibres are bruised and crushed to express the juices, there is no formation of anything in the nature of a sticky paste.

If fibres are pressed between the teeth and allowed to remain there, they are acted on by microbes. These, however, are not disease-producing, but saprophytic, those that live in dead tissues. These dissolve the particles, which are then washed into the saliva and swallowed, with this additional advantage, that the liquefying bacteria are not necessarily acid-producing, and the danger to the teeth does not arise from that source. They also contain fats, which besides being non-fermentable carbohydrates, are in themselves, by their lubricating action, an assistance to the cleaning and keeping clean of the teeth.

Along with these foods we eat potatoes and vegetables. Potatoes contain a very large proportion of starch, but the thorough chewing required by the meat, and the action of the fats and the meat fibres, make potatoes as part of a mixed course pretty safe on the whole. Vegetables, especially green vegetables, are largely made up of fibrous cellulose; they too call forth the action of mastication. The natural acids they contain are not destructive of the teeth, but help to increase the flow of saliva.

Coming now to the farinaceous foods, matters assume a different aspect; taken generally they are the softer foods. They require less chewing to reduce them to a fit condition for swallowing. Many of them are of a sticky constituency. If particles of these foods are forced into the crevices and interspaces of the teeth their presence is a source of real danger. We may take it as true that they play a larger part in diet than any other kind of food. Bread, of course, is the most important of the whole class. As far as its effects upon the teeth is concerned a great deal depends upon the kind of bread that is taken.

New white bread in the way it is baked in this country is the worst of all; the flour is finer, and it is more adherent to the teeth when being chewed. Containing already so much moisture, it is reduced to a paste and swallowed without proper mixture with the saliva; and both from the point of view of the care of the teeth and the good of the digestive system, it is a food to be avoided. Stale bread is incomparably better. It is naturally chewed more, does not become so sticky in the process, and is better mixed with the saliva. But still better than stale bread is the same toasted. Toast *must* be chewed, it provides more exercise for the teeth and jaws, does not adhere to the surfaces of the teeth, and is more easily digested. The form in which bread is eaten seems to have a direct bearing on the amount of dental decay.

The crusty roll, so common in France, and the long, crusty loaf—bread which looks as if it were made so as to sell conveniently by the yard—whose appearance is familiar even to casual visitors to that country, is a better form of bread, from the point of view of the health of the teeth, than is our own loaf. It would not be wise, however, to assign to that cause alone the better dental conditions that prevail there as compared with our own country. The whole dietetic habits differ from ours. A very much larger proportion of the population are country dwellers and country-bred. Their whole lives are simpler and more healthful. Foods, especially of the vegetable kind, which are not in common use in this country (salads may be mentioned as an example) are practically in universal use. Fruits are more extensively grown, although it would not be accurate to say that more are consumed, especially in the towns, since our importation makes up in this particular for any defect in home production. It would be unwise without very careful investigation, which would take account of all possible factors in the problem, to assign too much importance to any one article of food, or any particular dietetic habit, but in certain cases fair deductions can be made. In Norway a few years ago it was noted that, in the medical examination of the conscripts, those from a district where a kind of malt brown bread of a somewhat sticky character was in common use had an amount of dental caries appreciably greater than those from other districts where the ordinary brown bread formed the staple diet.

Opinions differ about many farinaceous foods. Chiefly on theoretical grounds adverse criticisms are made on porridge and milk, and yet in those districts in Scotland where it is most in use (say the northern and north-eastern parts of the country) the dental standard is higher than elsewhere.

There is one form in which bread is eaten, by children especially, which cannot fail to be harmful—that is, bread and jam eaten between meals, and more particularly at night before going to bed. The damage is done then both by starch and sugar. There can be little doubt that sugar is a source of a considerable amount of dental decay. It is true that in sugar-producing countries sugar-cane is chewed almost constantly, and the natives have very fine teeth. Here, in addition to the fact that the cane sugar is dissolved out of the cane, and that the chewing provokes a flow of saliva, which washes it out of the mouth, the cleansing and polishing effects of the fibrous cane counteract possible dangers.

The consumption of sugar in the form of sweets, on the other hand, produces more undesirable results.

Sweets are made with mixtures of gelatine and other substances of an adherent character, and in the process of fermentation a gummy substance is formed. The absence of fibrous matter, whose mastication would clean the teeth, leads to the saturation of other food particles lodged on the teeth with the sugar, an addition in a most dangerous form to the fermentable matter.

Reverting again to the question of the order in which foods are consumed at a meal, assuming that it includes what will provide adequate exercise for teeth and jaws, and without suggesting that the meal should begin with sweets and finish with the meat, the things which will leave the mouth in a clean condition ought to be kept to the end.

Mention may be made of the value of salads, and of fruits, more especially of apples, which require chewing, and both from that cause and because the vegetable acids they contain call forth the action of the saliva. Further, it may be pointed out that liquids taken after a meal help to wash away any lodged particles. Dr. Sim Wallace seems to assume that the whole question of the prevention of dental caries is a question of suitable food, and that the use of artificial methods of cleaning the teeth is superfluous if not undesirable. Now, although doubtless a most important point in the possible prevention of caries, it is difficult to find an explanation of all the facts connected with dental decay in the nature and order of the foods that are eaten.

A book for the general reader is not the proper place for a discussion of various theories, but it does seem decidedly unwise to neglect any means of keeping the teeth clean.

The effects of dietary habits on the chances of escape from dental decay of well-formed, healthy teeth lead to a few words upon teeth which are defective in structure, especially as regards the enamel. The most common and obvious defects are pits and grooves, caused, as has been said, by such ailments as rickets and fevers. These illnesses are direct interferences with the nutrition of a child, and malnutrition seems to affect the development of the enamel of the teeth. It is only reasonable to conclude that, if in from 4·6 to 7·1 per cent. of cases defects obvious to the naked eye are found, a much larger percentage of minor defects exist, which though not discoverable by the eye or the probe of the dentist, are sufficient to permit of the entrance of microbes and the beginning of decay. This probably explains the decay of the first molar tooth in many children within six months of its eruption, while in the same mouth practically all the temporary teeth may be found healthy and free from decay.

It is difficult in such cases to see how the temporary teeth should escape during more than four years under a given diet, and the first temporary molar succumb under the same diet in six months or even less. Almost invariably the cavities begin in the crevices of the crown; the depth of these crevices, of course, tends to make the food lodge there, but as the enamel begins to calcify, that is, really to form as enamel, on the tips of the cusps or points of the tooth, and the several areas meet in those crevices, imperfect development might be expected to show itself at the meeting-points. The development of the enamel of the temporary teeth depends on the nutrition of the child before and soon after birth; that of the enamel of the permanent teeth on the nutrition of early childhood before the permanent teeth are cut.

Nutrition means a great deal more than food. It does include food, but also plenty of fresh air, exercise, and healthy surroundings. It may not be immediately recognisable, but the results if the children are reared without sufficient good food, fresh air, and exercise and generally healthy surroundings, are imperfectly-developed teeth, more than normally liable to decay, and which in turn lead to defective nutrition, septic poisoning in one form or another, increased liability to disease, and general physical degeneracy.

Still another factor, determined by the general health, falls to be mentioned in relation to the care of the teeth. This is the condition of the fluids of the mouth. Normally the saliva is alkaline. Washing the teeth, it neutralises the acids which may be formed, and so is a valuable protective agency; but in cases of impaired health the saliva frequently becomes acid. Especially is this the case in such diseases as typhoid fever, rheumatism, scarlet fever, measles, diphtheria, and various digestive disturbances, giving rise in many cases to very extensive dental decay. Many conditions of ill-health, especially disorders of digestion, will also produce an acid condition of the saliva, increasing the liability to the attack of caries.

All such conditions call for special care of the cleanliness of the mouth on the part of the patient, if he is able to brush his own teeth and wash the mouth out, or on the part of his attendant if the patient is too seriously ill to attend to it himself. This is necessary, not only in the interests of the teeth themselves and of their future usefulness, but also for the effect it will have on the existing state of health and the chances of recovery.

The careful cleansing of the mouth has in itself a soothing effect, and an impaired appetite, and other consequences of the absorption of microbes by an already damaged constitution, are hindrances to recovery which care can remove.

No precaution to secure the cleansing of the teeth, either in health or in disease, can afford to be neglected, and therefore the toothbrush, though not a magic sceptre, whose use will banish decay, is so valuable that its use, and frequent use, should be—but alas it is very far from being—universal.

The teeth should be brushed at least twice every day, night and morning. At night more particularly, because during sleep undisturbed particles in contact with the teeth have more opportunity for fermentation, and more possibility of provoking decay than through the day, when the activity of the tongue, the flow of saliva, and the action of chewing other foods, especially of a firm character, may remove them. Thorough brushing of the teeth at night, just before going to bed, and certainly after the last meal is eaten, has more effect in preserving the teeth than brushing at any other time. The morning brushing also is important, since there are more microbes in the mouth then than at any other time of the day, and the effect upon the general health of washing the major part of them out of the mouth instead of swallowing them is decidedly beneficial. The reply of Dr. Sayre Marshall to his juvenile patient, who seemed to think too much was made of brushing the teeth, and who asked, "How often, then, must I brush them?" may be given as a general answer to the question, How often should the teeth be brushed ?

He said, "How often do you wash your hands and face ?" "Oh, when they are dirty." "Well then, you should brush your teeth whenever they are dirty, that is after every meal."

We have heard of the boy who washed his face once every day whether it needed it or not; and so we may say that the teeth should be brushed at least twice every day whether they need it or not. If it is possible to do so oftener so much the better. But, if not, a careful rinsing of the mouth with water will help the maintenance of cleanliness considerably.

A toothbrush should not be either too hard or too soft. If too hard it is apt to damage the gums; if too soft it does not get properly into the spaces between the teeth.

There is a right way and a wrong way to brush the teeth, as there is to do most things. The wrong way is unfortunately the easier and probably the commoner. The teeth should not be brushed across, drawing the brush as one might draw a bow across the strings of a fiddle, but up and down with a rotary motion of the brush, and brushing from the gums upwards or downwards towards the point of the teeth. That shape of brush the surface of whose bristles has a slight curve, and where those at the point of the brush are slightly longer and set with an inclination upwards, has an advantage in brushing the inner surfaces of the teeth and the crowns of the molars, which require as much care as that surface which shows between the lips.

In addition to the toothbrush a spool of floss silk is a useful adjunct. A short length of it passed between the teeth will remove what the brush may have allowed to remain.

Of mouth-washes, tooth-powders, and tooth-pastes it is not necessary to say a great deal.

The toothbrush and water carefully and thoroughly used is all that is essential. The tender covering of the mouth will not tolerate an antiseptic strong enough to have a very marked germicidal effect in the short time it remains in the mouth. Many mouth-washes containing simple antiseptics leave the mouth in a pleasant condition, a feeling of cleanliness which may induce to more frequent use.

Tooth-powders and tooth-pastes have a certain value in preventing the accumulation or formation of stains from tobacco or other causes. They should not be too gritty in character. Precipitated chalk, which is the powder base of most of them, is the coarsest grit which it is desirable to use regularly. Precipitated chalk is in itself quite good, or in the form of camphorated chalk, or with carbolic, making carbolic tooth-powder. Many antiseptics, of which thymol is a favourite, are made up with a base of chalk into tooth-pastes which are pleasant to use.

The following formulæ, given by Dr. R. Denison Pedley in his book on *The Diseases of Children's Teeth*, may be found useful:

1. Precipitated chalk	4 ounces
Curd soap in powder	½ ounce
Carbolic acid	20 minims
Otto of roses	5 „

2. Precipitated chalk	2 ounces
Boric acid	2 drachms
Orris root in powder	2 „
Curd soap	2 „
Oil of peppermint, or Oil of geranium	2 minims

Another very simple one is:

3. Precipitated chalk	3 ounces
Chlorate of potash	1 ounce

For mouth-washes the two following are simple and serviceable:

1. Carbolic acid	1 ounce
Glycerine	1½ „
Methylated chloroform	½ „

5 to 10 drops in a wine-glassful of water.

2. Dr. Miller's Antiseptic Mouth Wash:

Thymol	0·25
Benzoic acid	3·00
Tincture of eucalyptus	15·00
Alcohol	100·00
Oil of peppermint	0·50

A tablespoonful to a tumblerful of water.

There are, in fact, endless prescriptions which could be given for good tooth-pastes, powders, and mouth-washes. The one thing needful for the preservation of the teeth is cleanliness of surface, and the toothbrush and floss silk are really all that is essential. The use of powders and washes containing antiseptics is generally an agreeable addition of value as cosmetics, and in addition help to keep the toothbrush itself clean and sweet.

The condition of the brush deserves attention. It is best to keep it in a case with a lid away from dust or dirt, and to wash it well both before and after using. The brushing of the teeth and washing of the mouth is much better done at a running tap, where the supply of water is unlimited, than anywhere else.

The more attention that is paid to the washing and brushing of the teeth the less likelihood is there of toleration of anything wrong with a tooth. Defects will be more readily perceived, and a remedy sought from skilled hands.

No matter how much care is taken with food or with the brushing of the teeth decay may make its appearance. The earlier it is discovered the simpler will be the treatment required, and the more satisfactory will be the result.

Periodical visits to the dentist are on this account a necessary part of proper care of the teeth. The mouth mirror and probe will often reveal cavities, or the beginnings of cavities, unsuspected by their owner. The experienced eye can detect a little whitish opaque spot that indicates the presence of decay. The opening of the cavity is small, hidden between the sides of two teeth; when opened up, perhaps a quarter of the crown of the tooth may be found to consist of softened and infected dentine. To wait until the cavity became obvious might have been to wait until the half of the crown had been affected, and the decay was approaching close to the pulp chamber. Or it might be a little pinhead of black or brown stain on the crown of the molar, or two such joined by a thin dark line. The point of the probe detects the break in the enamel, the dentist begins to take away the decay; it is found penetrating along the canals of the tooth substance quite deeply, burrowing underneath the enamel. By the time it is all removed quite a large cavity is found to exist, the enamel on each side of the dark line has had to be broken away, because unsupported by healthy tissue, and yet nothing was detected by the owner of the tooth. That early treatment of small cavities is easier will be readily understood. That the result is more satisfactory is owing to the fact that the dentine infected by microbes can be thoroughly cleared out without the same fear of coming upon and exposing the central pulp. In a large cavity the greatest care has often to be taken to avoid that contingency, and suspected dentine, or even dentine that has passed beyond the suspected stage, has to be left on the floor of a cavity underneath the filling material, after having been sterilised as effectively as possible by the application of strong antiseptics and by other means. In addition to that a smaller cavity presents a more limited area where enamel and filling meet; that point is always the weakest point of a filling, where there is greatest danger of the entrance of microbes and the fresh beginning of decay. No matter how carefully finished a filling may be, the junction between it and the tooth is not quite such a perfect surface as that presented by perfect, unbroken enamel. Even when the visit to the dentist brings to light no fresh cavities, it will give an opportunity for the clearing away of any tartar that may have deposited on the necks of the teeth.

Tartar is a deposit of lime salts from the saliva itself, left just as lime is left on the bottom and sides of a kettle. Tartar, although not giving rise to decay in the surfaces it covers, give rise to irritation of the gums. The continual deposit of fresh layers forces the soft gums away from the neck of the teeth, the inflammation leads to the absorption of the tissues surrounding the necks of the teeth, and eventually to their becoming loose. The rate at which tartar may be formed depends on the constitution of the saliva, the proportion of lime salts it contains, but still more upon the work which the tooth is called upon to do. The whole of the teeth on one side of the mouth may be found quite clear of tartar and the other side with large deposits, in a case where the presence of a tender decayed tooth has led to the instinctive avoidance of that side in chewing. The two teeth which meet a tender one are frequently quite covered with tartar in a comparatively short space of time.

It might be well to give a brief indication of the various kinds of treatment which may be given to a decayed tooth.

Teeth may be filled with a variety of materials, each with different advantages and disadvantages for particular teeth and particular positions in these teeth. The best filling material for a particular cavity can only be determined by the dentist in whose hands the operation lies.

The preparation of a cavity consists in the removal of all the decayed dentine, and of enamel unsupported by healthy dentine, since the crystalline enamel is too brittle, without the solid and tougher cushion behind it, to bear the stress and strain of daily use. The cavity has then to be made of such a shape that it will retain the filling material. The exact shaping of the cavity will depend on the nature of the filling material, on the extent of the decay, and the position in the tooth of the cavity. These are elaborate details of purely professional interest. Speaking generally, the cavity is undercut or shaped with dovetails, so that its inside part is larger than the opening formed by the edges of the enamel.

Filling materials are various. There are amalgams—that is, mixtures of a metal or metals with mercury, forming at first a paste, which is packed in a plastic condition into the cavity, where it hardens. The commonest are an amalgam of copper and mercury, and amalgams in varying proportions of silver and tin with mercury.

Copper has the advantage of exercising a certain preservative effect upon the tooth substance, and the disadvantage of not only becoming black in colour, but also of staining the tooth substance surrounding it. The silver-tin amalgams keep a better colour, do not stain the tooth, or only slightly in certain cases.

Considerations of appearance limit the usefulness of these fillings in teeth at or near the front of the mouth. Gutta-percha, specially prepared, is another material very useful, especially in certain positions.

Another large class of filling materials consists of cements. Neither of the other two materials mentioned have any power of adhering to the tooth. Cements are useful in shallow cavities where undercuts are slight, in combination with amalgam, and in front teeth, because they much more closely resemble the colour of the teeth. They are also bad conductors of heat, and can be used in sensitive cavities and where there is little covering for the pulp of the tooth, when the conducting properties of the metals might set up inflammation, or at least lead to discomfort. Cements are of two kinds—oxyphosphate cements and silicate cements, the former being an opaque cement, and the latter a translucent cement, whose surface corresponds more closely to the appearance of the tooth than other material.

Cements, however, from their nature and structure are not so permanent filling materials; they wear down gradually, and are also acted upon to a certain extent by the saliva, so that while quite satisfactory from many points of view, they cannot be put in the category of permanent fillings.

Porcelain, of the same type of material of which artificial teeth are made, is also employed, especially, but not exclusively, in the front teeth. The cavity is shaped; a piece of porcelain exactly fitting and matching perfectly the tooth in colour and texture is made and cemented into the cavity, its retention being secured by the undercutting of the cavity and the roughening or undercutting of the inner surface of the inlay, as the piece of porcelain is called. The only thing visible to distinguish the filling as a filling is the thin line of cement at the junction of tooth and filling. In some cases a piece of gold, cast by a special process to the exact shape of the prepared cavity, is used in the same way as a gold inlay. Both of these have the advantage that they are strong enough to withstand wear and tear, and are quite unaffected by the fluids of the mouth. Gold is used as a filling material in an absolutely pure form. Small pieces are packed in, either in the form of foil or leaf, or pieces of crystalline gold, precipitated from solution, and collected in the form of strips or mats.

The process of gold filling is a delicate one, like others that have been described; but the result is good in so far as the solidity and strength of the filling is concerned. Its toughness makes the edges less of a danger-point. The smoothness and polish of the surface give no opportunity for the retention of food particles. There is no contraction or expansion, as may occur where molecular changes, due to the combination of two or more metals, take place, as with amalgams. But the colour does not approximate to that of the natural tooth. The only thing to be said in favour of its colour is that, not being readily oxidisable or acted upon by the fluids of the mouth or the foods that pass through it, it retains its own surface, and the colour is practically unimpaired.

Whatever filling material is used, and there are still others, the purpose is to supply the loss of tissue with a material which will absolutely exclude air and moisture, prevent the admission of microbes, and restore the tooth to complete usefulness. If the process of decay has gone so far as to involve the living pulp, it is, of course, impossible to pack foreign matter into direct contact with so sensitive and so vascular a body without disaster.

Before dealing with it, it must either be killed by the action of drugs, such as arsenic, or its power of sensation must be paralysed for the time being by cocaine, and it must then be removed entirely from the canal in each root and the chamber in the centre of the tooth which it occupies. These must be made absolutely aseptic, and the canals filled with some special filling material, before the cavity itself is dealt with. If the pulp is dead and the canals filled with putrid matter and swarming with microbes, and even more so if the septic infection has extended to the socket and the surrounding tissues of the tooth, a course of treatment to restore a healthy condition will be necessary, whose duration will be determined by the extent and severity of the disease. All this must be complete before the cavity can be filled up.

If decay has proceeded so far that not enough of the crown of the tooth remains to permanently stand the strain of mastication or to retain the filling material; provided that the root can be brought into a healthy condition, an artificial crown may be prepared and fastened on to the root. This may be made of gold if the tooth is not so near the front of the mouth as to make its use undesirable for æsthetic reasons, of gold with a porcelain facing, or entirely of porcelain. It may be fastened to the root by a tightly fitting collar, or by a platinum pin, fitted into the canal from which the pulp has been removed. In either case it is cemented into place, and forms an effective substitute for the lost crown of the natural tooth, and may play its part, in appearance, in speech, and in mastication for very many years. Like every other restoration of a decayed tooth, it not only plays its own part, but enables the opposing teeth to play their part, and so increases their chance of continued health.

Treatment such as has been outlined is the proper work of the dentist if his patients would only realise it. So many people only visit him when driven by pain. But pain in a tooth, instead of being an indication that treatment is required, is an indication that treatment has been delayed beyond the limits of wisdom. It may not be too late to save the tooth, but it is too late to treat it with the same facility and certainty.

It is quite true the dentist can extract teeth and supply artificial substitutes. These, however, although so much better than none, are really poor representatives of their natural predecessors, and are not to be compared with them either for appearance, strength, or effectiveness in use.

When artificial teeth are in use to fill up gaps in the mouth (and it is to be remembered that even a few natural teeth left in a mouth have a very considerable value in giving anchorage to the artificial ones, increasing their comfort, enabling them to be used more freely, and also serving to do the harder parts of chewing and biting), the need for care of the teeth is greater and more exacting than before.

If food tends to lodge between natural teeth and cause decay, still more readily will it lodge between artificial and natural teeth. Not only must the plate be kept scrupulously clean, but special attention must be paid to those parts of it which are in contact with the natural teeth; and the natural teeth themselves call for special attention to those surfaces in contact with the plate.

So many people say that the metal bands sprung against a natural tooth have worn the tooth away, when, as a matter of fact, wear in the ordinary sense has had nothing to do with it. Food lodges between the band of the tooth, fermentation sets in, and the resultant acid eats away the enamel. One sees hundreds of teeth with cavities the shape of the band of the artificial plate which is clasped to it, obviously caused by acid formed between the surface of the band and the plate. Such surfaces, it must be remembered, cannot be cleaned by the tongue, are not of such a shape that the washing of the saliva has much effect upon them, and unless very special attention is paid to their cleaning, decay is bound to result. In addition to thorough use of the brush with soap and water to clean artificial teeth, a small piece of cane, or even a wooden match, will be found useful for the polishing of the inside crevices and the bands which come into direct contact with the natural teeth.

THE PROSPECTS OF PREVENTION

There remains now for consideration the question of what can be done to combat the ravages of dental decay. In view of the seriousness of the consequences as affecting the physical development of the people the matter must be considered as one of more than individual interest. No question affecting the health of the mass of the population, or even of large sections of the population, can nowadays be considered as merely a matter of individual interest. Our whole policy in regard to health has been to widen the bounds of public interest. Its foundation is, of course, merely the isolation and treatment of those who are attacked by infectious disease, so that they shall not be allowed to remain a source of danger and infection to those who are healthy; that leads naturally to an examination into and a supervision of conditions of life which might lead to a spread of disease or increase of liability to an attack; and so we have sanitation taken entirely out of the category of private interests. The sanitary provision inside our dwelling-houses, its position and condition, its connection with the drainage system outside, the main drains, and the disposal and clearing away of all refuse, are now either entirely undertaken or rigidly supervised by the health authorities, not only because of their effect upon the incidence and prevention of infectious diseases, but because there has grown up a realisation that it is a matter of real public interest to have a healthy population.

The same underlying idea has led to all sorts of health regulations of the conditions under which people work. Factories and workshops must be cleaned, ventilated, and equipped with due regard to the health of those employed there. For the same reasons control and supervision, more or less adequate, is provided of the supply of milk and the purity of the food sold for public consumption.

The latest proof of advance in regard to making the healthiness of the units who compose the population a matter of national interest is to be found in the Health Insurance Act. Although a matter whose details gave rise to bitter controversy, which do not concern us in the least at present, there was general agreement on the provision of public money to supplement private provision for medical attendance. There was more disposition to question the adequacy of the public provision than to question its desirability. The one aspect of the Act which gave rise to least controversy was that which made provision for the treatment of tuberculosis, to which not only the insured persons and the national funds were to contribute, but also the various local health authorities. In fact the least controversial part of that whole Act, was that where the public share of the expense involved was out of all proportion greater than that contributed by the individual, and this, doubtless, is explained by the fact that public opinion realised not only how important the whole question of the treatment of tuberculosis is from the national point of view, but also because it may now be hoped to eradicate the scourge by proper and sufficient treatment.

Dental disease, as the provoking cause and the contributory cause of so many other serious diseases, is equally worthy of being the subject of a national campaign, which would yield results no less valuable.

The point to be considered is as to the form which it should take. In the first place it would need to be a campaign of education. People need to be taught the value of their own teeth, the need for care, and the consequences which arise from neglect; to be shown the connection between bad teeth and bad health. Without assuming that education only takes place in schools, which would be a ridiculous proposition, it is none the less true that the education of the years devoted to school life is of the greatest importance, and in the care of the teeth the earlier years of life are those in which neglect does incalculable harm which no later care can remedy.

For these and other reasons an important part ought to be filled by the public authorities who have the administration of education in their hands. Some of these reasons which make the matter of the care of the teeth a special concern of the education authorities may be indicated. After a generation of universal compulsory education, we have begun to realise the inseparable connection between the body and the mind, and the futility of expecting success in the development of the latter while neglecting the health and well-being of the former.

Royal Commissions appointed to inquire into the actual conditions that existed, brought such a mass of evidence together that a system of medical inspection of children is now an integral part of the educational administration. Many changes have followed upon this; the attention of parents has been called to defects hitherto unsuspected, some of the most serious character; defects of eyesight and hearing have been found to be the cause of what seemed before to be stupidity or carelessness. The schools themselves have been affected; more care has been devoted to sunlight and ventilation, to the cleansing and disinfecting of the class-rooms. For a certain proportion of children the ordinary school and the ordinary school work has been found to be quite unsuitable, and special schools of various kinds have been established. Schools for those of less than the average mental capacity, but who are still capable of being educated, by special methods and under special conditions; schools for cripple children, or those affected by certain diseases, which make their mingling with healthy children undesirable; and open-air schools, where the restoration of impaired health is made the primary purpose of the school's existence, the book work, and what is generally recognised as education, being fitted in just so far as health considerations will permit. The result of all this has been a gain to education, an improvement that will become more manifest as time goes on.

The purpose of medical inspection was not merely the accumulation of statistics, the compiling of masses of papers that few would read; but the securing of treatment for and removal of defects. Now, it has been found necessary to go further and make some definite provision for treatment, a provision whose necessity had been realised in several countries on the Continent, especially in Germany, many years before anything had been attempted in this country.

The defects for whose treatment provision was found to be most necessary might be divided into two categories—those requiring the attention of a specialist, whose fees were beyond the means of the majority of the parents of the children, and those which were widely spread and whose seriousness was not recognised. Defects of the eyes and the teeth are the chief among those. Whatever be the reasons assigned, it is significant that when less than a year ago a special parliamentary grant made it possible for Scottish School Boards to make some provision for medical treatment, the medical officers who advise them all decided independently, from their knowledge of the condition of the children, that the most urgently required provision was that for defective eyes and defective teeth. A beginning has accordingly been made in most of the larger centres of population, in the establishment of dental clinics, where treatment is undertaken. In this they are following the example of a considerable and growing number of education authorities in England.

The first, and perhaps the most obvious, concern of the educational authority in connection with diseases of the teeth is its effect upon attendance. It happens that the chief grants are now calculated and paid upon an attendance basis; and toothache is directly responsible for a good deal of irregularity. A difference of one per cent. in attendance is a serious matter in a city from the financial point of view. But apart from money the actual progress of a class suffers from irregularity. You cannot teach a child who is absent, and if the absence is only a day here and a day there, as happens from attacks of toothache, the rest of the class must be kept back while the teacher is making up the time and instruction lost by the absentees. The direct results of that nature are, however, a very fragmentary part of the whole consequences.

Experiment has shown that direct improvement of educational results accrues from a thoroughly hygienic condition of the mouth. One of the most interesting is given at full length in his book *Mouth Hygiene*, by Dr. Sayre Marshall. The experiment was made at Marion School, Cleveland, Ohio, by a committee of the National Dental Association and the Oral Hygiene Committee of the State of Ohio, with the co-operation of the Cleveland School Board. The school is an ordinary elementary one in what is called the "ghetto" district. Medical inspection had been in operation in the school over a period of three years, so that its effects had time to affect the records of the children in the school, and any changes observed would be due to the new factor introduced. Forty children were chosen from among those where the need of dental attention was greatest, including some of the smarter and some of the duller children of the school. The class records of these children for the six months preceding the experiment were taken, and in addition psychological tests were made under expert supervision, which would show the working efficiency of the child at the time he was received. These tests included "memory," "spontaneous association," "addition," "association by opposites," and "quickness and accuracy of perception" tests.

"Here was found a considerable number of children who exhibited bad oral conditions, backward physical development, retarded mental progress, and unruly or immoral characteristics. Examination of many of the children showed that, if the oral conditions were not the causes of the physical, mental, and moral backwardness, there was a striking parallelism. For the child whose mouth was unclean and incapable of proper mastication usually exhibited the conditions which the committee expected. That is, bad oral conditions, bad physical conditions, mental backwardness, and sulky or resentful or insubordinate moral attributes, were all closely associated. If one started from the other end of the chain, the result seemed to be the same; that is, the child who was notably deficient physically, backward mentally, and insubordinate, were found to have bad oral conditions. Whichever end one started from, the answer was that the conditions ran so closely together that their relationship was worthy of investigation.

"These children were then banded together and instructed in the care and use of the mouth and the teeth. A nurse was put in charge of them to instruct and see that they followed the instructions. Test meals were given them to show them how to masticate properly. They were provided with toothbrushes, and shown how to use them properly after each meal. A reward of a five-dollar gold piece was offered to each of the children who persisted to the end of the period. The mouths of the children were then put into proper order, and a series of tests made six months after the operative treatment was over, in the same way as before the beginning of the experiment.

"Of the children selected five withdrew because they did not wish to comply with the conditions, five were struck off because they failed to attend for the tests, and three because they did not continue to keep the teeth clean and brushed.

"The results as tested both by class-work and psychological tests showed a remarkable improvement, the increase in working efficiency according to the scientific test rising in one case as high as 168 per cent., and averaging 37·44 per cent. for the whole group, and the educational improvement, judged from the point of view of the class records, rising to an average of 99 per cent.

"Some of the individual results were even more remarkable than the average. One boy in particular, who was a sort of terror to the school, an incorrigible truant, rapidly qualifying for an industrial school, was completely transformed, and became manly and reliable, the headmistress recording his educational improvement as equalling 444 per cent. Everything was done to control the experiment as carefully as possible; no special attention was given to the children in class, many of the class teachers not even being aware, until towards the end of the period, which of their children were included.

"The results of such an experiment demonstrate the importance of the care of the teeth from an educational point of view, and justify the establishment and extension of dental clinics by all school authorities. It is to be specially noted that this was not merely a case of putting the mouths of a certain number of children in a thoroughly healthy condition. It included the teaching of oral hygiene and supervision of its practice. That is a work which must be undertaken by the school if a check is to be given to the ravages of dental disease.

"This is not a suggestion that still another subject should be added to the already overcrowded school curriculum. What is required is merely the modification of the teaching of hygiene, the making of it more direct, definite, and practical. A great deal of special teaching and training may and should develop in connection with the school dental clinic. Large numbers of the parents have no idea of the treatment of the teeth of the children, except taking out those that ache. The idea of such a thing as filling has never entered into their heads. Ignorance on the whole subject is absolute and complete. It will take years of work in and arising out of school clinics to arouse even sufficient interest in the subject; but interest can be aroused. In the Cleveland experiment it was found that the children appreciated the changes which followed upon having a healthy mouth, and long after the reward had been paid over to them continued and seemed likely to continue the proper care of their mouths.

"It is a common experience of the dentist to find young patients careless of their teeth, but when they have once had their mouths put in proper order they begin to take care and interest in the matter for themselves, and do eventually all that could be expected of them. The same results would accrue from the work of dental clinics.

"Unless attention can be paid to the teeth of children little is to be expected in the direction of preventing dental disease. By the time school life is over its ravages are so extensive, and so many teeth have suffered, that people have some justification for the idea so many have, that the best thing to do is just to let them all go and have them taken out, and their place supplied by artificial ones.

"The influence of bad teeth upon educational progress has been noted wherever systematic examination has been made.

"Some years ago Dr. C. E. Wallis made a long and detailed inspection of the teeth of the children in a representative London County Council School, and found that the children with the most unhealthy mouths were in most cases below the average of their age in general physique and weight. It was found also that those whose mouths were most septic were dull and apathetic, and usually one or two standards below where they ought to have been. . . . .

"These observations have been confirmed by similar ones made by Professor Jessen in Germany, who also supports the view of Professor Moeller, a distinguished German physician, that a healthy mouth is a great preventive of tuberculosis, and further declares that '*There is no department of public health which renders so large a return for the money expended as the system of treating children's teeth in school clinics.*'"

That care of the teeth during school life is effectual in preserving the teeth and starting young people on their wage-earning career with an effective dental equipment is shown by actual record to be a fact and not merely a theory. It is well known that a very large percentage of recruits for the army and navy are rejected on account of dental disease alone. But from one of the London County Council Industrial Schools, from which many hundreds of boys have gone to the army, there is not to be found on record a single one who has been rejected on account of defective teeth. In this school regular attention is given to the teeth of the boys. The health of the army is of course important, but the health of the army of industry is from every point of view, public and private, of infinitely greater importance.

If every child could be examined once a year for dental defects, and those made good, either by the private practitioner or by the school dental officer, it would be sufficient to accomplish a virtual transformation with very far-reaching effects. One of the great dangers of the present day is the wholesale loss of the teeth at a comparatively early age. Neglected during childhood and adolescence, the teeth, when a young person begins to earn money enough to pay for attention to them on his own account, are in such a condition as to encourage their reckless extraction by unqualified men, who drift from all sorts of incongruous occupations, and without previous knowledge or training, into the apparently lucrative one of supplying artificial teeth. With no knowledge of anything relating to the health of the body, and no care for anything but the money profit of the transaction, they prey upon the ignorance and the dental misfortunes more especially of the industrial population, by the aid of advertisements, &c.

Most people seem to be unable to distinguish between them and the dentist whose main business, after all, is the preservation of the teeth, and to whom their extraction and substitution by artificial ones is an unfortunate necessity, made so in a majority of cases by previous neglect.

Everything that tends to raise the standard of life, especially in towns, by its reaction upon the health of children will tend to improve the chances of preventing dental decay. The removal of overcrowding, which is a twofold question, including the overcrowding of the one- and two-roomed house, and even the three-roomed house, by too numerous inhabitants, and the overcrowding of an area by the excessive number of houses and too small a proportion of open space, the one measured by the cubic space of dwelling per inhabitant, and the other by the number of persons to the acre, would provide an opportunity for the enjoyment of fresh air and sunshine, which would have an incalculable effect for good on the health of the children.

Education with regard to the value of foods and their effects could do a great deal, but when one tries to find out why the simpler and more wholesome foods fall into comparative disuse, especially in the poorer parts of the great towns, optimism about the possibility of preventing dental decay by this means is not encouraged. Certain conditions produce certain tastes. Overwork of the house mother frequently outside as well as inside the homes, with a poverty both of fuel and utensils, is not conducive to skill or care in cooking. The absence of healthy surroundings brings on loss of healthy appetite, and a demand for highly seasoned or tasty foods to tempt the jaded palate. The slum produces a slum palate and a slum stomach. The one hope and comfort is that the slum is not eternal, and that the forces at work for the raising of human life will accomplish its abolition.

Especially in the case of children is care and knowledge required, and changes in habits which have no real justification. Mention has already been made of the pap-food system of feeding children. Another common habit fatal to clean and healthy teeth is the giving of bread and jam or biscuits after the child is in bed, the fragments of which inevitably remain on and between the teeth. The teeth should always be cleaned before going to bed, and if it is found necessary to give a fretful child something to keep it quiet, a piece of apple, which requires chewing, and which will help to complete the cleansing, would probably serve the same purpose of keeping the child quiet without laying the foundation of troubles which will mean sleepless nights later on, both for the child and those who live with it.

To expect any royal road or short cut to the prevention of so widespread a disease as dental decay would be foolish; but rapid progress along a road which will lead towards its elimination can be made. The first essential is a desire to travel along that road, which means a general realisation of the value of our own teeth. The second is care and cleanliness.

Clean teeth do not and cannot decay.

The essentials for the prevention of dental decay are simple and easily understood.

Simple foods and proper mastication. Regular washing of the mouth and brushing of the teeth at least night and morning.

Frequent and regular inspection by the dentist, and the early treatment of decay.

Nothing extraordinarily difficult is required, but merely sustained and continuous care within the reach and power of most people.

No attempt has been made here to give an exhaustive treatment of its subject, but to give, in language which everyone can understand, information with direct practical bearing on the teeth and their preservation. The difficulty has been not what to put in but what to leave out, and how to secure accurate statements without the use of technical phraseology.

If it succeeds in arousing interest, supplying information, and contributing its share to the general knowledge of the teeth, their function, the dangers they are subject to, and how those dangers may be avoided, and their consequences escaped, its purpose will be amply fulfilled, and its place in this book thoroughly justified.

JOHN A. YOUNG, L.D.S.

THE CULTURE OF PHYSICAL BEAUTY

One of our great philosophers has said, "A healthy body is the tabernacle—but a sickly one the prison of the soul." In the same way we may say that perfect health is the necessary foundation for all culture of physical beauty—for there are few physical attributes which can withstand the ravages caused by sickness. Homely features cannot be improved upon, it is true; but a bright, clear, healthy complexion goes a long way towards minimising their defects. On the other hand, the pleasing effect of features which are classically perfect can be altogether marred by the sallow complexion and unsightly skin blemishes which chronic indigestion, dyspepsia, and other ills invariably bring in their train. We cannot add or take away one inch from our stature, but the well-knit, supple frame of perfect health does a great deal to atone for excess or lack of inches. Thus, we can take comfort in the knowledge that the secret of the most enduring type of physical beauty lies first and foremost in the preservation of the health by a rigid adherence to the simple laws of hygiene. If we are to keep well we must have clean surroundings, rational living, including plenty of exercise, and abundance of fresh air, pure food and water, a suitably regulated diet, and sensible clothing.

In considering therefore the remedies for a bad complexion, skin blemishes, wrinkles, obesity, undue thinness, and other deterrents to beauty, we shall consider first and foremost the natural remedies, giving also, for the benefit of our feminine readers, some useful hints in regard to simple and harmless cosmetics as aids to beauty.

Skin and Complexion.—Perhaps nowhere are defects of hygiene more plainly featured than in the skin and complexion. Sedentary habits reveal themselves in the sallow and unhealthy-looking skins of those who have not realised that perfect cleanliness internally and externally is necessary in order to keep the skin and complexion pure. Sedentary habits are not conducive to internal cleanliness. Those who take little or no exercise, who eat too much and too often, whose diet moreover is unsuitable, cannot be surprised if the eliminating organs of the body fail to do their duty. Indigestion, constipation, and other stomach troubles prove the most relentless foes the complexion can have. It should therefore be the aim of all men and women who value their personal appearance to prevent these ills as far as is in their power.

A glass of hot water sipped slowly the last thing at night—and a glass of cold water with a little lemon juice taken the first thing in the morning has been proved by some people to be an unfailing preventive of constipation. Others have found the necessary remedy in a glass of hot water taken half an hour before each meal. It is a fact that people who suffer habitually from constipation seldom take enough water. On the other hand, those who are at all liable to indigestion should not take water or other beverages with their meals, but directly afterwards. An apple or a wine-glassful of orange juice taken half an hour before breakfast acts upon the liver and forms an excellent tonic. It is a good plan also to always have some stewed fruit upon the table at breakfast time. Begin the meal with some of this fruit. Never hurry over the morning, or indeed over any other meal.

The breadwinners of a family are very apt to literally "bolt" their breakfast in order to catch the train or omnibus which is to take them to their place of business. Needless to say, it is much better to rise half an hour earlier and to take the full time over the morning meal, than to allow oneself just sufficient margin to snatch a hasty repast. Indeed it would be better to get up an hour earlier if by so doing one can not only take one's breakfast in peace, but also have time to walk at least part of the way to one's destination. Nothing is more exhilarating than an early morning walk, but in these days of convenient train services and motor omnibuses which pass our very door, one is too apt to take things easily and give up walking exercise altogether, at the expense of health, and through the health of the good looks.

The importance of strict attention to diet cannot be too highly estimated. Curries, highly-spiced food, pickles, &c. should be taken in strict moderation, or in many cases avoided altogether. Needless to say, nothing has a more coarsening effect upon the skin than over indulgence in any kind of stimulants. Excessive tea and coffee drinking is also harmful. It is particularly injurious to the digestion to take tea with a heavy meat meal.

Faulty teeth are at the root of most digestive troubles. Never defer too long a necessary visit to the dentist, for a single decayed tooth in the mouth works a good deal of mischief. Where the teeth are bad it is impossible to masticate the food properly, and when the food is not properly masticated it cannot be digested. The care of the teeth is fully dealt with on pp. 239–261.

It seems hardly necessary to emphasize the fact that to keep the skin healthy personal cleanliness is essential. There is no more effective skin tonic than the daily tub, whilst a brisk rub down with the towel afterwards stimulates the pores of the skin to healthy action. Many people make a fetish of the cold bath, but its merits are apt to be overrated. Cold bathing may suit young, vigorous people, but as a general rule those verging towards middle life will do well to leave it alone. Most people, therefore, must content themselves with the bracing effect obtained by thoroughly sponging the body with cold water after a warm bath has been taken. It is most unwise of parents to force their children to take cold baths in the hope of making them hardy. Where cold bathing agrees with people it proves stimulating. For purposes of cleanliness, however, the warm bath is all-essential.

Some Hints in regard to the Toilet.—The face should never be washed in hard water. Rain water should be used when procurable. Failing this the water should be softened by boiling and by the addition of some good water softener such as a teaspoonful of borax, the juice of half a lemon, or some good prepared toilet vinegar or water softener obtainable from the chemist. For those afflicted with greasy skins oatmeal is the best water softener possible. Make some small muslin bags, fill these with the oatmeal and sew them up. Place one of these in the washing water, it will be found to have a most softening effect. The oatmeal can be made to do duty on three or four occasions; after this fresh oatmeal will have to be used. At night time use plenty of pure soap and warm water in washing the face. The thorough washing of the face at night time is essential if the skin is to be kept pure, otherwise the dirt and dust accumulated during the day will choke up the pores, preventing their healthy action, and a liberal crop of blackheads will often be the result of this neglect. In the morning use tepid water without soap. Wash the face with the hands, rubbing with a brisk circular movement. When sponges and face flannels are used, care should be taken that these are kept scrupulously clean.

Steaming the Face.—In the case of some skins a steam face-bath is occasionally required for the thorough opening and cleansing of the pores. Fill a basin with hot water softened with lemon juice. Bend over this, covering the head completely with a towel. A few minutes of this is sufficient to open the pores, then wash the face with warm water and soap, rinsing in water to which a few drops of benzoin have been added.

Blackheads, Skin Roughness, Sunburn, and other Blemishes.—The best preventive of blackheads is a liberal use of good soap and hot water. Pure Castile soap should be used at the night toilet. It should be well washed off after using, for nothing is so bad for the skin as to allow the soap to dry into the pores. The following lotion will be found an effective remedy:

1 teaspoonful precipitate of sulphur.
1 „ tincture of camphor.
1 „ glycerine.
8 tablespoonfuls of rosewater.

Mix well together, and apply after washing.

A little good skin food rubbed gently into the skin at night after washing will often prevent any tendency to roughness from cold winter winds, sunburn, &c. Face massage (*q.v.*) is also very beneficial. When coming in from a walk on a hot summer's day or from a game of golf or tennis, rub a little Icilma or any good face cream into the skin allowing it to remain there for about ten minutes, then wash off with soft water. Never wash the face at once upon coming in: this rule applies to winter as well as to summer.

Flushing, Red Nose, &c.—Indigestion, and, in the case of women, unsuitable clothing and tight-lacing are the most prolific causes of these ills. Happily few women tight-lace nowadays; but those who go about in the dead of winter in what are too aptly termed "pneumonia blouses," transparent silk stockings, and thin shoes cannot complain if they pay the penalty in the flaming colour of their nasal organ. The clothing should be light and loose yet sufficiently warm, whilst too much emphasis cannot be laid upon the necessity for adequate shoe leather. On very cold days either good strong-soled boots should be worn or sensible shoes with the additional protection of nice warm gaiters. It is an important point to remember that if the feet and the ankles are kept warm, healthy circulation of the blood throughout the body is promoted. Nowadays, when the heating of houses in winter has reached the level of a fine art, light dresses, stockings and shoes can well be worn indoors during the very depth of winter, but—and this is important—they should be worn indoors only. Out of doors one's clothes should afford adequate protection against the inclemency of the weather.

Tight-fitting collars, which press unduly upon the muscles of the neck, impeding the circulation, also cause flushing of the cheeks and nose, but their harmful effects do not end there, for they serve to destroy the beauty of the neck by causing either double chin or the formation of unsightly lines which are very difficult to eradicate.

Wrinkles.—These are caused by impoverishment of the subcutaneous tissues of the skin. They are landmarks of time which few can avoid, but with due precautions their advent may be considerably retarded. Unfortunately in these modern days of hurry and worry, premature wrinkles are becoming more and more the rule, and quite young people show the vexing little criss-cross lines between the brows and at the corners of the nose and mouth. The causes of premature wrinkles are many and varied, the most prolific being overwork, nervous strain, and worry. The cure consists in the first instance of removing the cause. It is a curious thing that really great worries do not bring in their train anything like the crop of wrinkles which are induced by a tendency to worry over trifles displayed by so many people nowadays. This tendency must be cured if the wrinkles are to be avoided. Try and cultivate pleasant thoughts, make an effort to control the mind in such a manner as to check once for all the undue tendency to worry. This brings us back once more to the fundamental question of health. Ill-health, a sluggish liver, the general sense of feeling below par, are very often responsible for an irritable, fractious disposition. See first therefore to the health of the body, and an easy and contented mind will in most cases follow.

Then there are the wrinkles which come from overwork and too much burning of the midnight oil. For these there is no more certain remedy than that afforded by a few weeks' change of air and absolute rest with plenty of good, wholesome food. Dry skins show a tendency to wrinkle much sooner than skins which have an abundant supply of natural moisture. The skin should never be allowed to get too dry, for wrinkles will invariably follow. A good skin food or other suitable emollient should be regularly used at night-time, and this, in connection with regular and persistent face massage, will serve to keep the dreaded wrinkles at bay.

Face Massage.—The skin food used for massaging the face should be the purest obtainable; it should be free from all animal fat, for this induces the growth of superfluous hair. Pomery skin food is very good for the purpose. For application after massage or in the daytime and before applying the powder to the face one of the non-greasy creams, such as Icilma or Creme Simon, should be used.

How to Massage the Face and Neck.—It is important to remember that all movements in face massage should be very gentle: they should also be circular and upwards. Take a little skin food on the tips of the fingers and begin with the chin. Place the first and second fingers of each hand so that they meet in the centre of the chin, and from this point massage outwards, following the contour of the face. Then, beginning at each side of the mouth, rub the skin food into the cheeks gently but firmly with the palm of the hands with a brisk upward circular movement. This prevents the formation of lines at the corners of the mouth, serving also to fill out any hollows in the cheeks. The massage movements should be followed by a very gentle tapping of the cheeks with the tips of the fingers. Great care should be taken in massaging round the corners of the eyes as the skin here is very elastic, and rough movements would do a great deal more harm than good. Massage very gently under the eyes from the nose and upwards to the temples. Rub upwards across any horizontal lines upon the forehead, then across the tiny vertical lines—often the result of too much frowning—which are apt to form between the brows. Finally, massage from the base of the nostrils along each side of the nose upwards. From five to ten minutes should be spent upon the massaging operations. Use no more of the skin food than the skin can comfortably absorb, and afterwards wipe off any superfluous skin food with a soft towel.

In most cases some astringent lotion will be found necessary to tone up the pores of the skin after massage. A good plan is to bathe the face in warm water in which from eight to ten drops of tincture of benzoin has been added. Benzoin should also be added to the water in which the face is washed the following morning. In some cases a non-greasy face cream, such as Icilma, can be applied after massage instead of the benzoin. The face should be thoroughly massaged in this way once or twice a week. Massage is not only beneficial as an eradicator of wrinkles but also as a skin and complexion tonic.

Lines on the Neck.—Massage is also beneficial in eradicating the lines which form upon the neck, though where there is a tendency to double chin the massage movements should be carried out without the skin food. Rub very gently across the horizontal lines and round the throat, afterwards gently tapping the flesh under the chin with the fingers. The old and wrinkled-looking necks which are often seen on quite young people are more often than not the result of wearing high and tight collars. Too much muffling of the throat in furs during the winter is also harmful. The throat should be kept free and untrammelled as far as possible, in order that the muscles of the neck may have full play. When wearing furs, always add some lemon juice to the washing water, as this removes discoloration. After washing, sponge well with cold water, both at night time and in the morning.

Exercise for the Prevention of Double Chin.—The following simple little exercise, if persisted in regularly, will strengthen the muscles of the neck and prevent the formation of a double chin. Crane the neck, stretching the chin forward as far as it will go, then bend the head slowly backwards until it almost touches the shoulders at the back, then bring it slowly forwards again until the chin touches the chest. Repeat several times, then with the chin well raised turn the neck slowly, first to the right until the face is looking over the right shoulder, then to the left. In very obstinate cases of double chin the wearing of a chin-strap at night is often beneficial.

Making Up.—It is unwise in most instances to have recourse to artificial means as an aid to beauty, but this rule cannot be applied to all. There are cases when make-up of some kind is almost a necessity. In these cases care should be taken that the make-up is so well applied as to baffle detection.

Powder.—A good face powder is a harmless and even beneficial cosmetic. Nowadays, if used in moderation, powder is not counted as "make-up," and most women would feel completely lost without their powder puffs. Care must be taken, however, that the powder is not used to excess and is not allowed to choke up the pores of the skin. Where powder is used the use of an emollient at night time to cleanse the pores is more than ever necessary. Rub a little non-greasy cream into the skin before applying powder. Leave it on for a few minutes, then gently wipe it off with a soft towel and dust the powder gently over the face. A good powder carefully used forms a protection for the skin against sunburn and the nipping effect of cold winds.

Creme Simon is a dry and pleasant face cream suitable for use before applying powder to the face, whilst Poudre Simon is a powder free from injurious ingredients. Cheap powders should be avoided, for they often contain ingredients such as mercury, which are harmful to the skin. A box of powder judiciously used lasts a long time, and therefore a fair price for it should not be grudged. Liquid powders are sold by toilet specialists chiefly as preventives of sunburn, &c. Great care and discrimination should be exercised in selecting a powder in this form, care being taken only to purchase those sold by some well-known beauty specialists whose name forms sufficient guarantee in regard to the purity of their cosmetics.

Rouge should be applied very sparingly, after the application of a little face cream which is lightly rubbed off with a fine linen rag before applying the colour to the face. It is sold in the form of paste or powder. Only the least soupçon should be applied if detection is to be escaped. Always make up in a good light, and dust the face well over with powder after applying the rouge. It is a curious fact that those who have the foundation or the remnants of a good complexion to build upon are always those who can make up the most effectively. Their skins somehow seem to take to the colour which looks quite natural. It is chiefly when used upon sallow, dead-looking skins that, unless exceptional care is exercised in applying it, make-up seems to betray itself to all observers. Great discrimination should therefore be exercised in the selection of rouge, and in applying it be careful to make it just as deep or as light as the natural complexion suited to the particular colouring would be. Powdered Collandium, which may be obtained from any chemist, gives a most natural-looking result if sparingly used. It is, moreover, quite harmless, which is a great consideration.

Constant using of powder and paint renders the thorough cleansing of the skin at night more than ever imperative. All make-up should be removed with the aid of a good face cream, and regular massage should be practised. In many cases a steam face bath will be found necessary at least once a week, to thoroughly open the pores of the skin.

Care of the Hair.—Good brisk brushing of the hair for at least eight minutes night and morning is essential to keep it clean and in good condition. Great experts on the care of the hair declare that half the trouble in regard to falling hair, &c. arises in the first instance from want of cleanliness. Too frequent washing is harmful, as it serves to dry up the natural oil. No hard and fast rule can be laid down as to how often the hair should be washed. In town it requires washing oftener than in the country. Greasy hair requires washing more frequently than dry hair to keep it in good condition. Where the hair is abnormally greasy, however, it is seldom healthy and requires attention. A hair specialist should be consulted and asked to prescribe some cleansing lotion to be applied once or twice a week. This will obviate the necessity for too frequent washing.

Falling Hair, where it occurs to excess, may generally be taken as a sign of ill-health. Before trying external remedies, therefore, the health should be attended to and a doctor consulted. The following is an excellent tonic for greasy hair; it will be found to eradicate undue greasiness, strengthen its growth, and prevent falling:

Cantharides, 2 drachms.
Oil of lemon, ½ an oz.
Red lavender, 2 drachms.
Add spirits of rosemary up to 4 oz.

A little of this should be well massaged into the scalp every other night with the tips of the fingers. In the case of very dry hair some preparation like Rowland's Macassar Oil should be rubbed into the scalp twice a week. Oil should also be rubbed into the scalp before the hair is washed. Never use soda in washing the hair. Use soft water and some good shampoo powder. Rudolph's Pine Shampoo is one of the best, or wash the hair in a lather of white Castile or other good soap. The yolks of two eggs well beaten up, rubbed into the scalp, washed off with warm soft water, makes an excellent shampoo.

Massage of the Scalp is most beneficial in promoting the growth and health of the hair if regularly persevered with. Massage every morning with the tips of the fingers, pressing them well down upon the skin with a light circular movement. Soon the scalp will tingle with a healthy glow. In the case of dry hair the tips of the fingers might be dipped in cocoa butter before beginning the massage movements.

Grey Hair.—There is no cure for the grey hair of advancing years, for as old age creeps upon us its colouring matter gets used up. No man or woman, however, should begin to go grey before nearing fifty if their scalps are healthy. Premature greyness can be arrested; but it must be taken in time. A good hair specialist should be consulted by all those whose locks show a tendency to turn grey at an early age. In most cases the general health requires attention. Dark hair as a rule turns grey sooner than fair hair, whilst dry hair loses its colour much sooner than hair which has a liberal supply of natural oil. There are drugs now on the market which are said to have the property of arresting premature greyness and restoring the natural colour of the hair, but these should not be tried without advice. It is best in all such cases to consult a good hair specialist.

Dyeing and Bleaching the Hair.—This should never be attempted by an amateur. If the hair must be dyed, let it be done in the first instance by a hairdresser who can give you a supply of the preparation when the dye has to be renewed. Most weird effects have been obtained by some people who have used peroxide of hydrogen and other bleaching and dyeing preparations when ignorant of their true properties and of how they should be used. There are many harmless and inexpensive dyes on the market nowadays which are effective enough. Elderly people would do well to think twice before dyeing their hair. In their case dyed hair seems to emphasize the lines upon the face, and to give a greater appearance of age than if the hair had been allowed to grow grey gracefully. In cases of premature greyness which has been allowed to go beyond cure, however, the hair may be stained with very good results.

The Eye, Eyebrows, and Eyelashes.—Bright eyes form not the least valuable gift of perfect health. All undue straining of the eyes such as reading or working in an indifferent light, &c. should be avoided. It is harmful also to sit facing artificial light when reading at night-time. Sit with the back to the light so that the latter is thrown on the pages of the book and does not glare straight into the eyes. A wine-glassful of orange juice taken in the morning will be found to make the eyes bright. Many people declare that this effect is achieved also by eating orange peel. After severe eyestrain the use of a little boracic powder dissolved in water and applied with the aid of an eyecup proves an excellent tonic. In some cases bathing the eyes in cold tea affords relief. Vaseline or cocoa butter rubbed into the eyebrows and eyelashes at night will promote their growth. Apply the cocoa butter to the eyelids on the end of a match around which a piece of cotton wool has been twisted. Apply under the lashes, curving them outwards: this will induce them to curl at the ends. Adults should never clip their eyelashes to make them grow.

Staining the Eyebrows and Eyelashes.—Very light eyebrows and eyelashes are apt to give the face an insipid look. The constant application of vaseline or cocoa butter at night tends to make them darker. If this is not sufficient "water cosmétique" provides a simple, natural-looking, and harmless stain. It can be had in various shades, and must be applied very sparingly with an eyebrow brush.

The Hands.—Well-kept hands are a sign of refinement which all should endeavour to cultivate. Men and women alike should be particular in this respect. It is no ways effeminate for a man to have well-kept, well-trimmed, and well-shaped nails, though many seem to think this is so.

For Whitening the Hands and Arms.—After washing at night-time rub with glycerine and rose-water or red lavender. Mix in the proportion of two parts of glycerine to one part of either rose-water or red lavender. Chamois leather gloves at least three sizes too large should be worn at night. With some people, in spite of all treatment, the hands remain stubbornly red. This is usually caused by defective circulation. Attention should be paid to the general health. Young girls and boys at the "awkward" age suffer a great deal from redness of the hands, but in their case this wears off as they grow older. Even those whose hands show no undue tendency to redness should make a practice of rubbing some emollient into the skin at night, as this has a most softening effect. Occasional bathing of the arms in milk has a very beneficial effect in making the skin white and soft.

Rough Elbows.—Rejuvenate the coarse, scaly skin by plenty of friction with nail-brush and loofah. If the roughness is very bad rub salt into the elbows at night before washing, and after drying apply a little cold cream. Avoid constantly leaning the elbows upon desk or table.

Manicure.—The nails should receive constant and regular attention if they are to show the well-kept appearance and half-moons at the base which add so greatly to their beauty. Some sort of manicure outfit, however simple, should be procured. With a packet of orange-sticks, a pair of curved nail scissors, a nail file, some emery boards, a nail polisher, a supply of nail polish, and some good cuticle cream wonders can be achieved. A little of the cuticle cream should be applied by means of an orange-stick to the base sides of the nails every night after washing. This softens the cuticle, so that it can be well pushed back without any danger of formation of hang-nail. After washing always push back the skin at the base and side of the nails with a rough towel. It is as well, also, to file the nails daily to avoid the necessity of too frequent cutting. Then when necessary apply the nail polish, and polish. This is sufficient for the daily care of the nails, but to keep them in perfect condition they should be manicured at least once a week according to the following directions.

After having first thoroughly washed the hands take some very hot water and soften it with the juice of half a lemon and make a lather with some good soap. Dip the tips of the nails into this lather of soap and water, which must be as hot as can be borne. Allow them to soak in this way for about five minutes, and the cuticle will be found to have become quite soft and ready for treatment. Take some cuticle cream (any kind of cold cream will do) on the end of the orange-stick and gently and firmly push back the skin at the base and side of the nails. In most manicure sets is to be found a useful little implement called a cuticle knife; this should now be passed round under the skin at the base and side of the nails to loosen any superfluous skin growth around the nail. Failing the cuticle knife the point of the orange-stick can be utilised in this way. Now, with the curved scissors, trim the nails to as oval a shape as possible. After cutting the nails file them into shape with the file, and round off all roughness with the emery board. Stains can be taken from the nails with peroxide of hydrogen, a very little of which should be applied on the end of an orange-stick round which a small piece of cotton-wool has been twirled. This serves to make the nails beautifully white. Next apply the polish and polish with the polisher. Then soak once more in hot water and, after drying, polish them again. Either paste, powder, or a special kind of liquid nail enamel can be used for polishing the nails. An excellent polish is to be found in the paste called "Ungual," which can be obtained for a shilling from all chemists. This is very lasting, and only needs to be applied every four days. "Kraska" is one of the best of the nail enamels.

Obesity.—An abnormally stout person can never expect to be really robust in health. A good many men and women show a tendency to obesity as they approach middle age. In some cases this tendency is hereditary, but if taken in time it can well be checked.

Any tendency to obesity is aggravated by want of exercise and unsuitable diet. Five miles a day has been said to be the minimum walking exercise that should be taken daily by men and women if they wish to keep in good health; but it is doubtful if ten out of every hundred follow this wise precept. There are some who, by force of circumstances, are compelled to lead a more or less sedentary life. The effects of this should be counteracted as far as possible. It is a great temptation for the busy worker to lazy away his (or her) leisure hours in a comfortable arm-chair with an interesting book, but this temptation should be strenuously resisted. A game of golf or tennis, an hour's sculling, cricket, or football, will be found much more beneficial, and will help to keep down the weight. The athlete is seldom threatened with a tendency to stoutness, merely because the constant exercise he takes serves to keep him fit.

There are some, however, who through force of circumstances are unable to participate in games. These should make a point of devoting twenty minutes every day to the practising of some suitable physical exercises. The following have been found efficacious in the cure of obesity:

(1) Inhale a deep breath and stretch the arms upwards above the head; then exhale the breath and bend forward, but without bending the knees, until the tips of the fingers touch the floor. Repeat several times. Then, after stretching the arms upwards, bend slowly backwards as far as possible. This second exercise is valuable in strengthening the muscles of the neck and back.

(2) Lie down flat on your back on the floor with arms extended behind the head and the feet well together. Then gently raise the left leg as high as it will go, lower it slowly, then raise and lower the right leg in the same way. Repeat several times, then raise and lower both legs together.

Diet for the Obese.—The diet of those threatened with obesity should be very carefully regulated. Most people either eat too much or too little, or else partake of totally unsuitable food. Men are apt to err in the first and last respects, whilst women eat too little, taking unsuitable food and spoiling their appetites by little "snacks" between meals.

Three meals a day is enough for the average person. Women invariably make a fourth meal of afternoon tea. A cup of tea at four o'clock does no harm, but be content with taking a thin piece of bread and butter or a biscuit with it; avoid hot cakes and indigestible pastry.

A suitable but not a heavy meal should be taken in the middle of the day if the chief meal is at night. The woman worker who contents herself with a bun and a glass of milk at lunch-time may feel assured that she is doing her best to increase her weight, let alone the fact that she is not obtaining sufficient nourishment—buns and other doughy food are the worst things that could be taken by those inclined to be plump. All starchy and sweet foods should be avoided. No sugar should be taken in tea or coffee—if sweetening is required saccharine should be used for the purpose. Bread should always be eaten toasted, butter taken in moderation, and jam, marmalade, &c. altogether avoided; also potatoes, pastry, and confectionery of all kinds, cocoa, rice, macaroni, haricot beans, &c. Plenty of good fruit and fresh green vegetables will be found beneficial. Ale, stout, and all red wines should be tabooed. Constipation and indigestion must be prevented at all costs. (See section on "DISEASES.")

One last hint to those who dread obesity. Be as active and energetic as you can, never stay late in bed in the morning. Get up at seven o'clock, if possible, all the year round, and endeavour to keep regular hours.

Figure Development.—Excessive thinness is almost as detrimental to good looks as undue stoutness. The ultra-lean person should take plenty of good nourishing food, avoiding highly-seasoned dishes and anything likely to give rise to indigestion. Follow all the rules prescribed in these pages for the preservation of health. The ultra-lean man or woman will find deep breathing exercises invaluable in assisting figure development. Deep breathing should be practised every morning before dressing. With the mouth closed inhale a deep breath, hold this for about eight seconds, then exhale slowly. Practise breathing in this way for several minutes. All kinds of healthy exercise should be taken, such as is afforded by outdoor games, swimming, rowing, &c. Some simple physical exercises for the development of the chest have been described in another part of this book (see p. 159).

For "Care of the Teeth," see pp. 239–261.
For "Care of the Feet," see p. 268.

RITA STRAUSS.

THE CARE OF THE FEET

The modern shoe is not made to fit the foot; rather is the foot made to fit the shoe. The average man would be insulted were his tailor to offer him a ready-made suit of clothes, yet he takes it for granted that his feet are like those of every other man, and that what fits others will do for him. This lack of care in the selecting of one's foot-wear is the cause of most of the ills which affect the feet. High-heeled shoes, dress slippers, and most of the fine boots offered for one's inspection may be neat, but they seldom or never fit properly. The shoemaker should take tracings of the feet, and have shoes made from these tracings.

For comfort in walking thick woollen socks are essential; the thin fancy socks and the openwork stockings of the present day must be eschewed by people with tender feet. Socks and stockings should be marked "right" and "left"; the universal practice of clothing the right foot with the sock that happens to lie nearest the hand is wrong.

Tender feet may be rendered less tender by a little care. Bathing them in salt water or in a solution of alum in water every night hardens the skin. In hot weather socks ought to be worn once only. Dusting powder is much used by soldiers when on route marches. Perhaps the best remedy for tenderness is soap: turn the socks inside out and smear the toe with ordinary soap. People who dance much will find that a sock smeared with soap will prevent blisters arising. Mendings often cause irritation, especially when at the heel of the sock; and a "shuffling" shoe is fatal to comfort. People who suffer from foot tenderness should always wear shoes or boots with very thick soles, *e.g.* golfing shoes. Socks made after the manner of gloves, with separate parts for the toes, are sometimes recommended

Those who desire not only comfort but neatness of the foot will treat the feet as they treat their hands. Apply the methods of manicuring to the toe-nails: cut them straight across, press down the skin or "quick" that overgrows the nails.

Corns.—These are the result of the intermittent pressure produced by tight boots. The corn may grow on any of the toes or on the sole of the foot, or it may occur between the toes. In the former case it is usually hard, while in the latter it is soft.

Prevention.—See that the shoes do not pinch the feet in any way. It is better to have them made to order than to trust to getting a comfortable ready-made pair.

Treatment.—Soak the foot in warm, soapy water until the corn is softened. Then with a clean razor shave the corn, and apply a plaster. The object of the plaster is to diffuse the pressure produced by the boot.

After soaking the foot and before applying the plaster the following may be painted over the corn each night:

Salicylic acid . . .	15 grains
Flexible collodion . .	2 drachms

Care must be taken to see that the dead skin is removed before the next application of the paint.

Bunion.—As the result of pressure on the inner side of the base of the big toe a small sac containing oil develops over the bone. This sac is produced in order to lessen the effect of the pressure on the bone. The bone, however, usually becomes inflamed, new bone is deposited, and there is formed a lump which tends to force the big toe to override the second toe.

Prevention.—Here, again, one should have the shoes made to order.

Treatment.—If the bunion is inflamed rest the foot, and apply cold cloths. Cotton-wool ought to be worn between the big toe and second toe to keep the former in its place. Should the bunion be troublesome a doctor must be consulted, as possibly the removal of the oil-sac is the only remedy.

Chilblain.—This is most common amongst children, and is due to poor circulation and to the lack of proper protection of the feet in cold weather. The affected toe becomes swollen and red, and may form the seat of a sore. At first the part is itchy, but soon it becomes painful.

Prevention.—Thick woollen stockings and boots with thick soles ought to be worn out of doors. Warming the feet before putting on the boots should be avoided.

Treatment.—The foot and limb ought to be massaged in order to promote a good supply of blood to the part. The general health ought to be improved by means of cod-liver oil or Parrish's Syrup. Balsam of Peru should be applied to the affected toe.

Sweating Feet.—In hot weather this is a common and troublesome complaint. As a result of it blisters and sores may develop, especially on the feet of those who walk a good deal.

Prevention and Treatment.—The feet should be washed in salt water every night and carefully dried, special attention being paid to the spaces between the toes. A fresh pair of woollen socks, well dusted inside with boracic powder, should be worn each day, and shoes should be used in preference to boots. If blisters develop prick them with a needle which has been sterilised by holding it in a gas-flame for a minute. Then apply a piece of lint covered with zinc ointment.

Flat-foot.—This occurs mostly amongst young people who are on their feet for long periods, *e.g.* errand-boys, nurses, shop-assistants. Owing to the strain on the foot the arch gives way, the foot loses its spring, and the person walks with a shuffling gait. There may be shooting pains in the foot and leg.

Treatment.—Rest is imperative. The feet ought to be massaged frequently. Broad-toed boots with low heels should be worn, and inside them there should be artificial supports for the arches of the feet.

Ingrowing Toe-nail.—This is a condition where the flesh grows over the side of the nail, causing ulceration. It is caused by the pressure of tight boots against a nail which has been rounded at the corners.

Prevention.—Cut the nail straight across instead of trimming the corners.

Treatment.—Thoroughly wash the foot, and pack little pieces of aseptic gauze, moistened with hot water, between the nail and the flesh. Let the nail grow until it projects beyond the toe, and then cut it in the manner mentioned above.

Hammer-toe.—When a boot is too short for the foot something must yield, and as the toe, being jointed, is less rigid than any other part of the foot, it is forced into a bent position.

Prevention and Treatment.—Take care to have the shoe longer than the foot. In the early stages much may be done by passing a narrow bandage across the top of the foot, under the big toe, and over the second toe (assuming it to be the affected one), finishing by carrying it under the other toes and round on to the top of the foot again. This tends to pull the toe into its normal position. Where the deformity has existed for some time, and cannot be reduced by bandaging, the best plan is to have the toe treated surgically.

N. S. Neill, M.B.

COMMON SENSE IN TRAINING

Many astonishing theories or superstitions about training have prevailed in England and are not yet dead. "Surely you do not let your men wash ?" a professional trainer said to a University coach ; and the belief that washing is weakening has still a considerable following. Quite a few years ago members of the University eights who were supposed to have brought the art of training to the highest pitch, suffered cruelly both in health and fitness because they were forced to drink too little. The water lost must be made good. Beefsteaks and tea—a horrible mixture—are still thought almost necessary at training breakfasts, and some people still put faith in that very indifferent food, calves'-foot jelly. In Oxford, to give one example, a number of these foolish beliefs were finally destroyed by a doctor who gave several lectures on common sense in training. He was afterwards appointed a sort of official to the athletic club, and, thanks to his common sense, training became a much more pleasant and useful period. It still happens that the members of the eights are reduced before the race to such a pitch of nervousness, much of which is the result of wrong training, that they have to occupy their spare time in the evenings by any sort of handiwork, such as basket-making, which can be provided for them. The "needle," as it is called, or state of high nervous tension, is more or less inevitable when a man is specialising to the utmost on any one event. In America even the football players are sometimes "trained so fine" that they break down into a state very like hysterics when the strain of the match is over. Members of a beaten side have been seen to throw themselves on the ground and simply cry.

This cannot be altogether avoided, perhaps, in games and athletics, when the competition is of the keenest, any more than in the highest intellectual work. But the great mistake of particular training is that it is too widely divorced from what I would call "daily training." Daily training is the real thing. We should always keep ourselves in some sort of training ; and though, of course, for a special occasion something very much more strenuous is required, this extra effort should be in principle an emphasis of daily training, not a new sort of daily existence. It is obvious that different people are suited by different methods of feeding, and perhaps of exercise. Mr. Eustace Miles reached the very perfection of condition on a diet that consisted very largely of dried-milk biscuits and fruit. One of the fittest men I ever saw was a champion cyclist who never varied his diet, in training or out, and that diet was strictly vegetarian, consisting very largely of bread. On the other hand, beef is the standard food in most training diets, and no doubt it serves its purpose in the production of muscle and energy. Again, it is unquestionable that the Belgian eight who won the Grand at Henley were greatly benefited by a considerable indulgence in sugar. They carried about lumps and ate them when they pleased ; but especially before rowing a course. Different forms of competition require different forms of fitness. The great Japanese wrestlers set out chiefly to acquire weight. They eat enormous quantities, and are massaged to enable them to digest it. They travel with their own special cook, who is an expert at this training diet. The result is that, though the men grow enormously bulky, they also develop muscles like steel.

Nevertheless, in spite of all the difference between individuals and the games they play and the end in view, there are certain principles of training which will apply in all cases—to the slim Swedish jumper or the Japanese wrestler, or the University eight or the South African distance runner.

Those who discourse on training almost invariably divide the subjects into the two heads of diet and exercise ; and treat the two very much as if they had little connection. Of course the two divisions are useful and distinct enough ; but under neither division is there any room for mind ; and I am convinced that mind, or the exercise of intelligence, is the most important thing in any training. The real secret of success is the attainment of that half-intellectual, half-physical process, which we can give no better name than rhythm. It includes poise and balance and the continuous selection of the line of least resistance. By far the greatest exponents of the art of training are the Swedes. Though American achievement in athletics is as great, indeed greater, the Swedes are the best masters in the science of athletic rhythm. Without describing in any detail their way of instruction I may say why this rhythm is so advantageous. If you do a thing in the right way, that is apply the maximum force with the minimum effort, you touch the very height of athletic enjoyment. A clean shot, when the gun, as it were, cannot help swinging along with the bird ; the rhythmic drive at golf, when the club seems to do all the work ; "the feel of a perfect fourer," as the cricket poet sung ; and in running most athletes have now and again felt the extraordinary joy of what is called technically a "lift," when by some accident of balance of mind and body you suddenly quite surpass yourself for a short space, for ten or twenty yards it may be. You have found the rhythm, and shot away from the rest no one knows how or why.

English people have often failed signally in training because they have not recognised the axiom that it is best to do things in the best way. One example may suffice. Year after year Oxford and Cambridge athletes laboured at throwing the hammer; but even great lusty Scotsmen could not throw it more than about 100 feet. The Americans came over, showed the proper rhythm of the movement, and in a few years the average throw increased by 30 feet or so. Now those who threw in the early English manner did themselves—and sometimes their neighbours—bodily harm. The muscles fought one another. There was strain at every point. Body and arms and legs were in no due association. In consequence it was no fun to throw the hammer, and without interest food does not feed nor exercise develop muscle in proper proportion. Laugh and grow fat. Enjoy and grow strong. Recognition of this was really at the root of the successes of the Greeks, and at the wonderfully efficient system of gymnastics which with them covered half education. The Greeks were taught all the common movements much as the Swedes are. The Greek walk, for example, was a very definite art: the ball of the toe might not leave the ground before the heel of the forward foot was firmly planted, and so on. There was a right carriage of the arm and head. Indeed proper walking should, I think, be put in the forefront of training, of both daily training and special training. If anyone wished to confer a general blessing on the people he could do few things more practically useful than to teach the children to walk. In pure athletics the most salutary method of training is undoubtedly to alternate walking days with running days. A long walk and short, brisk walks every other day give a stamina and a fitness that nothing else can. It is a recent discovery in the science of the body that the movement of walking pumps lymph about the body as do no other movements. Those who cannot walk from any physical deficiency are now often made to go through the movements of walking, solely for this purpose. But apart from this, walking hardens the muscles of the leg and body, and indeed arms, in the steady, gradual way that is most effective. But walking exercise will do the maximum or minimum good according to the style and manner that is practised. One can walk very fast by leaning well forward and letting the legs almost flop forward in a long, loose stride. One can walk with an air of great smartness by adopting the British military method. But both these two contrasted styles are bad, the military perhaps the worse. The whole pose is bad. The body thrust forward as to its upper part and pulled in as to its lower part is in an unnatural posture, which, it is now said, produces internal weaknesses that directly encourage consumption. And in regard to progression nothing could be worse than pulling back with the body while pushing forward with the legs. It makes an over-short stride a necessity. It is essential in walking and in running that the weight of the body should be forward. Professional walkers often attain this by holding their arms in front of them—not straight in front but considerably in front. Young runners will often give a picture of the obvious drawback of the opposite pose. Their elbows appear behind their back in acute angles, answering to the angle of the knees that appear an absurd distance in front of the body. To walk properly, then, the body should, so to speak, be over its work, so as to facilitate a long and easy stride. But this stride should not be forcibly long, not should it be limp in any sense. One of the best of professional runners attributed a great part of his success in training to his method of walking, and the remarkable part of his style was the use of his toes. He consciously pressed with the toes at every stride, and this pressure gave him a more than military crispness. But as he was innocent of the goose-step he kept his feet low and slipped over the ground at an astonishing pace. He taught his pupils to enjoy walking merely for the sake of the physical pleasure of crisp and quick movement. Surely as a means to success on the path, or indeed in any athletic competition, the closest attention to the art of walking is to be recommended at the outset. Use every part of the body, toes and even fingers. The muscles of arms and shoulders should be just perceptibly taut, so that, as they move to and fro in time with the stride, they also work in some degree the chest, and stomach, and back. If a man would so walk even as little as three or four miles a day he could hardly help feeling the delightful sense of fitness growing through his frame; and by practice anyone can find out soon what inclination of the body from the hips most helps the ease and smoothness of the stride. There are Frenchmen who consider that nothing so greatly improved the health of the nation as the series of experiments on ways of walking made by one or two men of science. They resulted in regular instruction on the act of walking with bent knees. On this system, which it is worth everyone's while to practise, walking is not a heel and toe exercise, but a flat foot and toe exercise. The leading foot is placed on the ground flat and the stride is very low. For distance walking the increase in speed and ease is extraordinary; and the physical effect is good, if all "floppiness" is excluded from the gait. A crisp and buoyant and, if the word may be used, a *happy* walk is the basis of all training. There is no substitute.

The young do not need training in the limited sense of the word. All they have to do is to practise the game or exercise after the best manner and commit no excesses. Great weight of muscle is not desirable. The heart has little work to do compared with the grown man's, thanks to the relative size of the arteries; and the limbs are naturally pliable. But all through the growing time the growing organs, as well as the members, need stimulus; and ball games probably give this as nothing else does; but it is doubly necessary to learn style and economy of effort. Training in the way of exceptional diet or exercises does not begin to be necessary before the age of twenty; but in this first term of life what has been called style ought to be sought and taught and practised in every common movement—style in walking, sitting, standing, lying, breathing; and in all the athletic acts, such as throwing, jumping, or hitting a ball. The rules are few and simple, after all.

In walking	Symmetry of movement. Upright head. Lean forward from the hips. Expanded chest. Alert muscles, nowhere limp.
In standing	Weight on both feet. An upright spine. Transference of weight forwards and backwards, not from side to side.
In sitting	When working, uprightness and a raised chin. Legs neither stretched forward nor curled back. "Eyes front," whether for writing or reading.

In lying, the head should never be high. In all ball games the balance and pose ought to be learnt and thought out separately, as it were in parts. It is a thing to remember that one of the best of skaters, a man always at the top of fitness, said that he learnt most of his skating in his bedroom, realising the movements and solemnly posing before his looking-glass.

The older person needs more and more training the older he gets. Up to forty man can attain to great achievement largely by practice. Health will follow exercise rightly, that is rhythmically, taken. After forty in men and rather earlier in women, training becomes in some sort a necessity, especially for those who have trained hard or taken much exercise earlier. What happens in exercise is that the heart and lungs do much more work in order to supply the blood with more oxygen. By reason of this work they become big, powerful organs. If they are allowed to dwindle they become a danger, and bodily fitness is almost impossible. On this account the very first task in daily training is the breathing exercise. It is best to lean forward a little, with both hands holding the back of a chair or some such object, and to fill the lungs as full as is comfortable, taking slow but not ponderously slow inhalations. Of course breathing exercises ought to be practised in all training. For swimmers it is almost as essential as the stroke; and everyone, whether schoolboy or business man, who is sedentary for many hours, breathes too shallow and slight a breath; and many use the mouth too much and the nose too little. At all ages there are particular dangers. The danger of youth is too prolonged exercise. Therefore training should be below the full measure of severity. With the young it is not the pace that kills, but slow, weighty, and prolonged exertion. What is dangerous and weakening at a later date is suddenness or rapid acceleration of effort. Training must be slow, regular, and never intermitted. As to the general regulation of a day in training, it is quite certain that it is good to take half an hour's light exercise before breakfast. That exercise must not be slow. A slow walk is of the smallest advantage as a stimulus. It does not "help the pumps." An athlete in training may very well walk some fifteen miles either in the morning or afternoon, with light exercise, but again quick exercise, in the other part of the day. The qualities of quickness and endurance must both be studied every day. If the man in training gets up at 7 and goes to bed at 10.30 and takes three, only three, fair meals, he need not be very particular what he eats so long as it is plain and wholesome; and sugary things are avoided soon after meat. Sugar is good and necessary, but is probably worst in the form of pudding.

Every man should know something of the Swedish system of exercises, and select some exercises for daily use, especially the exercises entailing balance and working the muscles of the lower half of the body. Clubs and dumb-bells should be very light. It is a good thing in walking to hold something in the grip of both hands.

W. Beach Thomas,
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HABITS AND CONDITIONS INIMICAL TO HEALTH

Irregular Habits, &c.—Few things are more certain than that irregular modes of conducting the ordinary processes of the body are a sure means of inducing disease.

The most obvious of these irregularities is that which leads to chronic constipation. A surprisingly large number of people neglect to secure a regular daily action of the bowels, whereby they lay themselves open to much discomfort and positive ill-health. There are some persons whose bowels normally move only once in every two or three or four days, but such persons are very rare.

There ought to be an evacuation of the bowels at about the same hour each day, and tendencies to constipation are rather to be met with dietary changes than with an appeal to laxatives. Much can be done at first by "training" of the bowels, *e.g.* by going to stool at about the same time whether there be a clear call or not. Plainly, special attention must be devoted to forming this habit in children.

Irregular times of eating are deleterious in that quite irregular demands are made upon an alimentary mechanism which has been shown to perform its duties in times that can be scheduled. How long irregular habits in the way of eating can be continued without producing evil effects depends upon the individual, but it is plain that, early or late, they must lead to catarrhs of stomach or bowels.

Of insufficient eating it is unnecessary to speak, as, apart from poverty, it is an indication of the poor appetite of some abnormal condition, ranging from ordinary transient emotional disturbance to some serious bodily lesion. But over-eating has at least two sets of evils in its train. In the first place it throws an excessive strain on the digestion, which manifests itself in dyspepsia, various disorders of stomach and bowels; and the fact that cancer is more a disease of the well-to-do rather than of the poor has sometimes been attributed to the more generous diet and possible self-indulgence of the former class. In the second place, over-eating is a powerful predisposing factor to that degenerative condition of the arteries known as Arterio-schlerosis, the significance of which effect is best realised in the light of the axiom, "A man is as old as his arteries."

Sedentary habits, to which many workers are of necessity given, may be very deleterious to the health of some, though on the other hand such habits often appear to suit others admirably. Probably, however, it would be wise for most workers at sedentary occupations to take measures to counteract the effects of their mode of life.

For the flabbiness of muscle which is the main effect, showing itself in weakness of the ordinary voluntary muscles and in the alimentary musculature—whence dyspepsia, constipation, &c.—some not too strenuous type of physical exercise is needful. This might take the form either of such games as golf, tennis, rowing, cricket, &c., or of a course of an accredited system of physical culture. Proper attention should also be paid to the ordinary hygiene of life as regards baths, diet, fresh air.

Abnormal sexual habits are spoken of elsewhere. The debilitating effects of excessive sexual excitement in any form are well known, as are also the risks of venereal disease, especially associated with indiscriminate sexual intercourse.

Sleep.—Some people sleep too much, others sleep too little. The hours that an individual ought to sleep depend upon such factors as age and work. But, roughly speaking, eight hours have been found a reasonable allowance for adults; children ought to sleep longer, while old people sleep much less. Insufficient sleep produces neurasthenia, lassitude, and mental sluggishness, with loss of power of concentration and diminished working capacity. Among slum children it is a too little recognised factor in stunting growth. Insomnia, which may result from insufficient sleep, is treated elsewhere.

Alcoholism.—While many circumstances may induce people to have recourse to alcoholic drinks, such as emotional distress, insomnia, physical pain, dull, monotonous occupation, opportunity as in workers in the liquor traffic, there is very often a predisposing cause inherent in the individual in the shape of a special susceptibility to alcohol which is not infrequently hereditary.

The description and treatment of acute alcoholic poisoning are to be found elsewhere. Here we have to do rather with chronic alcoholism, a condition ensuing on habitual use of alcohol, marked by degenerative processes throughout the body, and including cases both of intermittent fits of drunkenness and of steady "soaking."

The symptoms of chronic alcoholism come on slowly. The first thing the alcoholic notices is often tremor of the hands, lips, and tongue, which is most marked in the morning, but this is accompanied by lassitude, low spirits, lack of energy, irritability of temper and mental dulness, insomnia, and nervousness. The breath is fœtid, thirst is considerable, the appetite is lost, a jaundice may be noticed about the whites of the eyes, the nose is red, and the skin of the face may assume a purplish hue. From the gastric catarrh set up by alcohol the patient is often sick in the morning, and the bowels range between constipation and diarrhœa.

The blood-vessels become thickened and lose their elasticity, the heart becomes dilated, the liver overgrown with hampering fibrous tissue, and the alcoholic becomes subject to all the associated symptoms.

The effects on the nervous system are most definite. The moral and mental qualities are dulled and debased; want of self-respect, unblushing deceitfulness, loss of memory, mental enfeeblement, melancholia, may all be manifested. In men particularly delirium tremens may from time to time appear, and in women multiple peripheral neuritis (*q.v.*) may ensue—sometimes as the first thing necessitating the summoning of a physician.

The whole resistance of the body to illness is lowered; the fatal issue of pneumonia, especially among alcoholics, is well known

The *treatment* is as usual, isolation of the patient if possible, and cutting off alcohol. Under the Inebriates Act special Retreats are licensed to receive alcoholics, provided he enters voluntarily. The patient undertakes to remain under treatment for a specified length of time, and if he runs away during this period he can be captured and brought back. This treatment ought never to be less than of a year's duration. It consists in removing the alcohol, and combating the depression, restlessness, dyspepsia, and insomnia by suitable means—tonics, sedative drugs, careful feeding, massage, and exercise.

There are numerous special cures, of which many are of the patent quack variety. Among these one may class the "temperance" substitutes, which contain alcohol in proportions ranging up to 45 per cent.

The addition of emetics such as apomorphine and ipecacuanha to alcohol before the alcoholic subject drinks it would doubtless be most efficacious, if it could be achieved regularly enough to create a sufficiently strong mental impression.

The "gold cure," consisting of a mixture of the chlorides of gold, sodium, ammonium with other drugs, taken every two hours during the day, combined with hypodermic injections every four hours of strychnine and atropine, along with hydro-therapeutic measures, various kinds of baths, has been much praised, and is said to produce cures after a month's treatment.

Various other drugs, such as red cinchona bark and quinine, gentian, ergot, strophanthus, have been recommended.

Hypnotism has proved very successful, but, on the other hand, has not been without its failures.

But the outlook in chronic alcoholism is not good. The craving is firmly rooted, and even after months or years of abstinence, the reformed character may give way again.

Absinthism.—There has been described a special form of alcoholism following on the habitual over-indulgence in various liqueurs and aromatic essences, and most particularly in absinthe. Symptoms of chronic poisoning come on after quite a short period of drinking—in less than twelve months, when the amount of alcohol consumed is insufficient to account for the state induced. The absinthe devotee becomes liable to most distressing epileptiform convulsions, coming on suddenly. Sometimes these fits are associated with maniacal manifestations, the subject of them screaming, and shouting, striking himself and those about him, tearing at his chest, and so on. In addition, he shows signs of general nervous disturbance, giddiness, and morning nausea, marked tremulousness, tendency to perspire readily, with a great super-sensitiveness of the skin, the lightest touches often causing intense pain. At night there is often great pain in the muscles, and rest is broken with nightmare and uncanny hallucinations. There is naturally much mental deterioration.

Chronic Opium Poisoning, or Morphinism.—The devotees of opium and its derivative, morphia, are found to take the drug in one or other of three ways, by eating it, by smoking and so inhaling it, and by injecting solutions of it under the skin.

Opium-eating in many Eastern countries is as common as tobacco-smoking is in many Western countries; the drug takes the place of those nerve stimulants or sedatives—tea, coffee, alcohol, tobacco—which Western civilisation has apparently made needful. The drug is consumed either in pill form or as laudanum, many grains of opium and as much as half a pint of laudanum being taken in a day by confirmed morphinists.

Opium-smoking is different from opium-eating in that very much less morphia enters the system, but nevertheless the narcotic effects of opium are produced. This method of taking opium is mostly condemned for the surroundings which so very often accompany it—the opium den, which in the Orient as well as in European seaports is haunted by the lowest of the low.

Injection of morphia is in this country now the commonest mode of introducing the drug into the body, though it is said to be on the wane, thanks to the unceasing care among doctors in its use. But the morphia syringe is still a terribly familiar factor in the lives of many.

Now, who are the morphinists?

Roughly, they can be classified according to the predisposing causes, pain, ennui, some odd instability of temperament, of which the last is probably present in most cases accompanying other factors.

For patients dying of some incurable painful disease the use of some narcotic is hard to forgo, and almost as hard to encourage in the case of morphia, which brings in its train such emotional and physical changes. And the habit can be defended at least.

Sometimes patients suffering from a prolonged painful condition not immediately fatal have found refuge in the opium habit. These also it is difficult to condemn.

But beyond these two cases there exists the large number of people who take morphia purely for the delight of it. These include persons who have been given morphia during some passing illness and so learnt the habit, persons who from mere *tædium vitæ*, weariness of life, "boredom," lack of reasonable occupation, have taken to it, these including most of the wealthy devotees; others, like doctors and druggists and scientists, have become morphinists out of sheer weakness, having every opportunity and thinking somehow to avoid the consequences; others are the "decadents," the emotionalists, the neurotics, to whom excess in alcohol, opium, or any other similar drug is natural and seemingly inevitable. In all, one would predicate the predisposing insatiability in their nervous make-up.

Morphia is taken not for the deeper torpor which large doses produce on the ordinary person, but for the less drastic effects of small doses. Small quantities of morphia ($\frac{1}{2}$ gr.) lessen the voluntary movements, and induce a drowsy feeling which passes into actual sleep unless the patient is aroused continually by something in his surroundings. While awake, his actions appear quite normal, and only his inability to concentrate attention on anything for more than a few moments and his tendency to sleep betray him. The sleep is described as a fit of abstraction, a kind of "brown study" rather than actual sleep, but the state of mind induced is nearer to dreaming than to any intellectual exaltation, such as is often ascribed to morphia. The stream of thought does seem to flow more quickly, the imagination perceives images more vivid and realistic, but the logical sequence of thought is diminished, and notably all sense of time is gone. From this "brown study" the dreamer passes into a real slumber, in which, however, he may continue to dream, and after some hours awakes more or less refreshed and his usual self, with perhaps some slight nausea only or dryness of the mouth.

When the taking of morphia for these effects becomes habitual, the symptoms at first are slight, and at first there may be no observable effects on the general health, and there are even cases where the habit has gone on for years without any obvious detrimental results. This, however, is rare. In time the doses have to be increased often to enormous amounts. And when the morphinist comes out of his trance, he begins to be assailed more and more with feelings of weariness and mental depression, with sickness sometimes, and colic. Sooner or later the effects on his constitution are apparent. He becomes thin and worn and prematurely aged. His complexion is sallow and muddy-looking, his hair grey. His skin is itchy. He sleeps, eats, and digests poorly. In temper he is irritable, and, save when under the influence of his drug, depressed. He is restless, untidy in his dress. His moral character shows deterioration, for habitual opium-takers are notorious as inveterate liars. Hence finally the morphinist becomes a most wretched, unhappy individual, until a state of weakness is attained, when he takes little or no food, and dies of weakness.

Treatment.—The sole method of treating the morphia habit is isolation and seclusion in some form of medical institution. The habit cannot be overcome in home surroundings, and the patient must be removed from his home and friends for a considerable period—sometimes as long as a year.

The withdrawal of the drug may be accomplished entirely at once or more slowly by degrees. When an effort is being made to treat a patient without special seclusion, the drug may be withdrawn suddenly, so that the worst of the symptoms excited by this withdrawal can be got over before the relative or friends can relent. But unless the patient has been taking small doses the risk of such quick withdrawal is collapse. On losing the sedative action of the drug the patient passes into a state of great restlessness, insomnia, and excitement. He suffers from sudden chilliness and fever, from sickness, hiccough, diarrhœa; he becomes collapsed and possibly unconscious. And to obviate this collapse it is often necessary to administer morphia!

Hence the practice now is to reduce the morphia slowly—but this of course where only fairly large doses are being taken—until in some ten days the amount given is very small. The difficulty begins here, however, for the patient now feels the effects of withdrawal. He suffers from a marked hypersensitiveness to all that stimulates his senses, heat and cold, light, &c., and from an excessive mental restlessness. It is at that stage that so much depends on the care and incorruptibility of the attendants, when the morphinist is trying by all means, fair or foul, to get a supply of his drug. As far as possible in the dyspepsia that is nearly always present, he must be generously dieted, and if necessary tided over the most serious period of mental disturbance with such narcotics as chloral, bromides, &c. Massage, baths, fresh air, must all be invoked to aid in improving the nutrition.

In many ways the cure of morphinism, as of other drug habits, is practically the Weir-Mitchell treatment.

In order that the patient may be confirmed in his new good habits, it is needful to re-educate him almost in moral habit. Hence, as an after-cure, the patient is generally sent with a strong-minded travelling companion on a sea voyage; failing this, some other arrangement may be made for a quiet way of life until his bodily and mental health are restored.

With all this procedure hypnotism may be combined, and it has given good results in a number of cases. Its best success has been with the less severe types, but the presumption is that more prolonged hypnotic treatment might be at least as efficacious with severe cases as any other mode of treatment.

For relapses are unfortunately frequent. The need of morphia in the "cured" patient may arise from the strain and stress of the everyday world, but sometimes from a curious nervous crisis unconnected with ordinary affairs, when for one or two days he is overwhelmed with a feeling of depression and utter weariness accompanied by digestive disturbances, nausea, vomiting, diarrhœa. And it is against relapse from either source that the patient has to be guarded.

The treatment of relapse is the repetition all over again more drastically of the original treatment.

Cocainism.—The results of the cocaine habit are even more disastrous than those of alcoholism and morphinism. The drug is mostly taken by hypodermic injection, although it is present in a cordial, "coca wine," and in coca snuff and coca lozenges. Generally speaking, the cocainists are people of the same slightly unstable type as the morphinists. The habit is not so readily acquired from medical use as is the morphia habit, for the drug has been employed to produce constitutional effects only very rarely in medicine, its chief and certainly wrongous use being in the cure of morphinism; the outcome of which use is to transform the morphinist into a cocainist.

Taking cocaine, at least by the habitués, produces a feeling of freshness and joyousness. Weariness is dispelled, and the intellect moves freely and rapidly. A general conscious well-being pervades the mind. But the state is very transient; the cocainist rapidly passes into deep depression, accompanied by insomnia, nausea, and prostration, and another dose is required to lift the cocainist to his higher state. As the habit grows, mental and physical deterioration becomes evident. Hallucinations, especially of animals crawling over the skin, delusions especially of persecution, irritability of temper, weakening of the will, show themselves; the eyes are sunken, the complexion sallow, the hands become tremulous, the appetite is lost, diarrhœa sets in, and the whole body wastes.

The unfortunate thing about the cocainist is his ignorance of his state. The morphinist, in his lucid moments, recognises his bondage, but the cocainist is too imbecile to realise his condition and co-operate in his cure. He, like the morphinist, must be isolated under skilled attendance, where the symptoms of his intoxication, the lost appetite, diarrhœa, emaciation, and the insomnia and general distress produeed by depriving him of the drug, can be met and treated. As in the case of the morphinist, narcotic drugs may have to be employed at first. Regular feeding and massage play a large part in the cure, which may take many months.

The Hypnotic or Narcotic Drugs: Chloral, Sulphonal, Veronal, Trional, Tetronal, Bromides, &c.—The habitual use of these drugs is acquired mostly in the treatment of insomnia. And the general effects of their long-continued use is very much the same whichever drug is employed. There is built up, primarily, the craving for the sleep-bringing drug without which sleeplessness appears inevitable. And under its influence there begins a gradual enfeeblement of mind and even of body. Thought and action become liable to vagary. Self-control is lost and the emotions are more unguarded. Bromides especially are apt to produce a very considerable dulling of the intellect. Physical signs consist in tremors, in weakness of muscles, irregular action of the heart. Chloral has a specific depressant effect on the heart, blood-pressure, and respiration, and is to be differentiated from other narcotics and hypnotics in that larger and larger doses of these other drugs can be taken without immediately disastrous results, while at any moment an ordinary, not excessive, dose of chloral may prove fatal even in a habitué.

The treatment of these habits is practically that of morphinism.

The Ether Habit.—While intoxication of a sort can be produced by the inhalation of ether, it is most commonly taken as a beverage, rather less than a wine-glassful at a time. Its attractiveness lies in the transient but lively nature of the intoxication and the slightness of the aftermath. In habitual consumers, however, quite definite bad results can be observed. They suffer from poor digestion, and catarrh of the stomach. The pulse is irregular. Tremulousness makes its appearance, notably in the forearm and neck. And there is general weakness and nervous exhaustion, with a special lowering of morality, the habitué being ready to go to any lengths to procure his drug.

The treatment is that of other intoxicating drug habits.

Chloroform.—The value of chloroform inhalation in inducing sleep and in relieving asthmatic and other spasmodic conditions is unfortunately too well known, and many fatal accidents have terminated its habitual injudicious use. Continued employment of chloroform will induce such mental and bodily changes as are described in connection with the ordinary hypnotics. But like chloral it is a traitorous drug, and at any time the inhalation of quite small quantities may be immediately fatal.

Hasheesh.—This drug habit is chiefly of interest because it is still practised in India, though in this country its use is but small. The drug is taken in three forms—ganja, or the dried, resin-coated, flowering tops of the *Cannabis indica* plant, charas, the resin, and bhang, the dried leaves. And it may either be taken by the mouth or smoked. The effects of this *Cannabis indica* or Indian hemp are twofold: it excites the flow of thought and it induces sleep. After a dose there is then a period of somewhat incoherent excitement resembling that produced by alcohol, after which the person lapses into a contented, languorous condition and then falls asleep. The most interesting feature of the mental state is the presence of multiple illusions. Under the influence of hasheesh all adequate sense of time and space are lost, all manner of grotesquely impossible gay visions present themselves, and among native devotees of the drug these visions are often of a highly voluptuous character.

In moderate use hasheesh has no bad effects, and it can be used as a stimulant much as tea and alcohol are used, to produce relief from mental or physical fatigue. But taken to excess it has very marked mental effects, producing a tendency to acute maniacal outbursts necessitating asylum treatment, and generally enfeebling the mind, inducing a shallow, callous, lazy mental state, which may be cured when the drug is given up, but which is liable to pass into a permanent mental weakness. Insanity, in short, is the goal of the immoderate use of hasheesh.

The treatment in all cases is the removal of the drug.

Coffee.—The active principle of coffee is caffein, but there are also present various volatile substances which have much to do with the carminative properties of coffee, *i.e.* its soothing effect on the digestion in the form of the after-dinner cup. Its best-known and most useful property is, however, as a stimulant of the higher cerebral centres.

Of coffee it is true, as of tea and tobacco, that its effects vary much with the individual, so that there are people in whom the habitual uses of coffee may induce a disturbed state of health, a species of chronic poisoning. Such persons complain of nervousness, find themselves too easily liable to agitation; they are pale, haggard, and often tremulous; their digestion is poor; they often suffer from irregularity and palpitation of the heart. All these discomforts are temporarily relieved by more coffee, so that the sufferer is quite unaware of the origin of his troubles, which all disappear when the coffee is cut off.

Tea.—The ordinary cup of tea contains just as much caffein as a cup of coffee, but it may contain a certain percentage of tannin in addition.

Many persons take tea in large quantities, often with every meal, and find it a most useful constituent of their diet. Others again suffer from well-marked symptoms following any large use of tea.

Like coffee it stimulates the higher centres in the brain, but sometimes this may be carried to extremes in restless sleep broken with startings, and nightmare, in actual sleeplessness, in mental confusion, and giddiness. Dyspepsia, accompanied with a considerable amount of pain, is often induced by tea, while palpitation, anæmia, nervousness, and a fine tremulousness may also be present.

The treatment consists in recognising and cutting off the cause.

Tobacco.—It has not been proved that the moderate use of tobacco is in any way injurious, and indeed many will testify to its beneficial action as a sedative. But here, as elsewhere, it must be remembered that " one man's meat is another man's poison "; a like amount will produce in one man no symptoms, and in another the pallor, the perspiration, the nausea, and prostration of an overdose—familiar to many beginners—or the occasional giddiness, the shaky hand, the palpitation, and sleeplessness, that are the premonitions of continued excess.

The following are some of the main effects of tobacco consumption, which can be put down to nicotine and the other poisonous bodies, mostly " pyridine bases," contained.

The heart is at first slowed and then accelerated, and in many cases its beat becomes irregular and intermittent. This "tobacco heart" is especially common in young men who indulge heavily before being quite seasoned, and other symptoms of it are palpitation, vague feelings of discomfort about the heart, and sometimes faint turns.

Decay of the teeth and chronic inflammation of the tongue and throat are certainly among the results of smoking, and cancer of the lip, if not a result of smoking, is at least most common among smokers.

As for its effects on the alimentary system, flatulence and acid indigestion are not infrequent, while its stimulating properties on the intestinal tract are utilised in the "cigarette before breakfast" cure for constipation, and in the after-breakfast pipe.

The nervous system is affected in one occasionally terrible way and in several minor ways. Occasionally atrophy of the optic nerve and blindness have followed the use of tobacco. Minor manifestations are giddiness, more usual in cigarette smokers and inhalers, tremulousness, sleeplessness, and every now and then neuralgia.

Anæmia is a not unusual result of tobacco, and is to be classed among the " warnings."

Because of its cardiac effects tobacco *may* be exceedingly dangerous, and has undoubtedly killed some of its devotees. The cure for its evil consequences is its abandonment.

D. G. WATSON, M.B.

THE PREVENTION OF PHTHISIS

There is no doubt that the children of tuberculous patients are more likely to contract phthisis than those who come of a hardy race. This hereditary predisposition consists more of an imperfect development of the body than of the direct transmission of the tubercle bacillus from either parent. It is of the utmost importance, then, that those who have such a predisposition should make every effort to get the chest and lungs so thoroughly developed that they will be able to resist any attack made by the organism of phthisis. Much may be done even in infancy to raise the tone of the system. Care should be taken to see that if the tonsils become enlarged, or adenoid vegetations develop, they are at once removed by operation. Adenoids block up the passage leading from the back of the nose to the wind-pipe, and force the child to become a mouth-breather. The result is that the chest does not develop properly, the child's growth is hindered, and its constitution is so weakened that it is unable to fight against disease. A habit which cannot be condemned too strongly is that of covering an infant's face with a veil before taking it into the open air. The veil makes nasal breathing very difficult, and the baby is forced to breathe through the mouth.

Every child should be encouraged to play as much as possible in the open air. The outdoor games of children are of the greatest benefit in helping to develop every part of the body, and, moreover, a good supply of fresh air is continually being taken into the lungs.

Measles, scarlet fever, whooping-cough, and most of the ailments of childhood leave behind them a weakened constitution, and so it is essential to watch the child carefully during convalescence. An abundance of good substantial food must be given, but sweetmeats and delicacies only given sparingly. The child should be supplied with plenty of milk, and cod-liver oil given regularly.

For the adult whose chest is not so well developed as it might be the respiratory exercises given on pp. 159–160 are of great benefit. They have as their object the expansion of the lungs to their fullest and the thorough diffusion of the inspired air through all the little air-sacs of which the lungs are composed. In ordinary breathing the apices of the lungs expand comparatively little, and it is just here, where movement of air is less than in any other part of the lungs, that the tubercle bacillus is likely to settle. If this be borne in mind it will be at once apparent that breathing exercises, which produce an increased expansion in the apices, and expel the stagnant air contained in them, will do much to resist the invasion of any disease-producing organism. There is practically no movement above the collar-bone in tranquil breathing, but when a deep inspiration is taken a bulging will be noticed. This is caused by the inflation of the apex of the lung and the tightening of the muscle behind which it partly lies. This muscle, which is one of the extraordinary muscles of respiration, is attached above to the bone behind the ear, and below to the top of the breast-bone and the inner end of the collar-bone. Since the right lung goes half an inch higher into the neck than the left, there may be more bulging on the one side than on the other.

Besides breathing exercises, there are many other exercises which are excellent for developing the body, *e.g.* walking, swimming, cricket, golf, boxing, cycling.

Singing and whistling are very good exercises for improving the condition of the chest and lungs, but the playing of wind-instruments is to be avoided, as the pressure produced is apt to break down the partitions between the little air-sacs.

The chest should be hardened by means of cold water. A cold bath in the morning is an excellent stimulant, but if it be found that shivering follows it should be discontinued. At the least, however, the neck and chest should be sponged each morning with cold water, and then rubbed vigorously with a rough towel.

Massage with or without oil may be employed. It stimulates the circulation, and thus benefits not only the chest but every part of the body.

Dress should be loose and comfortable. High corsets, starched shirts, and tight collars should not be worn, as they form an impediment to free respiration. Flannel underwear or underwear of loosely woven wool had best be used. The feet should be kept warm by means of woollen stockings and thick boots.

No person with a hereditary predisposition to tuberculosis should sleep with a phthisical patient or wait on such a patient. He should keep away as much as possible from crowded, badly ventilated rooms. His bedroom should be warm, dry, and well aired. The windows ought to be kept open at night, so that a good supply of fresh air may be provided; but care should be taken to avoid draughts.

Smoking is not to be recommended. At the most one pipe after each meal should be allowed.

Many people who have a predisposition to consumption are apt to become pessimistic. This attitude must never be adopted. The man who is depressed in spirit is less likely to make an effectual resistance against disease than the man who is always optimistic. There is no reason why anyone with a tubercular diathesis should not be able to resist successfully the attack of the tubercle bacillus if he follow out the instructions given here.

N. S. Neill, M.B.

AVERAGE HEIGHTS AND WEIGHTS

Table I.—Average weight of the male child during the first twelve months of life:

	lb.		lb.
Weight at birth . . .	6·8	Weight at seven months .	13·4
„ one month .	7·4	„ eight months .	14·4
„ two months .	8·4	„ nine months .	15·8
„ three months	9·6	„ ten months .	16·8
„ four months .	10·8	„ eleven months	17·8
„ five months .	11·8	„ twelve months	18·8
„ six months .	12·4		

Table II.—Average height without shoes, and average weight with clothes of all classes in Great Britain:

Males: Age last birthday	Height ft.	Height in.	Weight st.	Weight lb.	Females: Age last birthday	Height ft.	Height in.	Weight st.	Weight lb.
1	2	5½	1	4½	1	2	3½	1	4
2	2	8½	2	4½	2	2	7	1	11¾
3	2	11	2	6	3	2	10	2	3½
4	3	1	2	9	4	3	0	2	8
5	3	4	2	12	5	3	3	2	11
6	3	7	3	2½	6	3	6	2	13¾
7	3	10	3	7¾	7	3	8	3	5¾
8	3	11	3	13	8	3	10½	3	10
9	4	1¾	4	4½	9	4	0¾	3	13½
10	4	3¾	4	11¾	10	4	3	4	6
11	4	5½	5	2	11	4	5	4	12
12	4	7	5	6¾	12	4	7½	5	6½
13	4	9	5	11½	13	4	9¾	6	3
14	4	11¼	6	8	14	4	11¾	6	12¾
15	5	2¼	7	4¾	15	5	1	7	8¼
16	5	4¼	8	7	16	5	1¾	8	1
17	5	6¼	9	5	17	5	2½	8	3½
18	5	7	9	11½	18	5	2½	8	9
19	5	7¼	9	13¼	19	5	2¾	8	12
20	5	7½	10	3¼	20	5	3	8	11½
21	5	7½	10	5	21	5	3	8	10
22	5	7½	10	7	22	5	3	8	11½
23	5	7½	10	7½	23	5	3	8	12
24	5	7¾	10	8	24	5	2¾	8	9
25–30	5	7¾	10	12¼	25–30	5	2	8	8
31–35	5	8	11	6	31–35	5	1	8	9

Table III.—Average weight for height of a man with clothing on, aged thirty:

Height ft.	Height in.	Weight st.	Weight lb.	Height ft.	Height in.	Weight st.	Weight lb.	Height ft.	Height in.	Weight st.	Weight lb.
5	0	8	0	5	5	10	2	5	10	12	1
5	1	8	4	5	6	10	5	5	11	12	6
5	2	9	0	5	7	10	8	6	0	12	10
5	3	9	7	5	8	11	1	6	1	13	0
5	4	9	13	5	9	11	8				

Table IV.—Average weight for height of a woman, dressed:

Height ft.	Height in.	Weight st.	Weight lb.	Height ft.	Height in.	Weight st.	Weight lb.	Height ft.	Height in.	Weight st.	Weight lb.
4	10	7	0	5	2	8	2	5	6	9	13
4	11	7	4	5	3	8	9	5	7	10	8
5	0	7	7	5	4	9	2	5	8	11	4
5	1	7	12	5	5	9	9				

These Tables show as nearly as possible what relation a person's weight ought to bear to his or her height. They have been compiled by taking the average heights and weights of a great number of people; but although this method of calculating from averages is the only one that could be used in this case, its results are only approximately true. People differ so widely in physique, some being tall and thin and others short and stout, that a certain deviation from the standard set up must be allowed. A departure of about 20 per cent. in either direction is not necessarily of great importance.

When a person is to be weighed periodically the same scales should be used on each occasion, and he should be without shoes and, if possible, clothes. Where it is impracticable to remove the clothing $\frac{1}{24}$ of the weight should be deducted in the case of a man, and $\frac{1}{20}$ in the case of a woman, as these proportions roughly represent the weight of the clothes.

During the first five years of life growth is more rapid than at any subsequent period. Boys are slightly taller and heavier than girls, although growth increases at the same rate in both sexes. Between the ages of five and ten boys grow more quickly than girls, but from ten to fifteen the reverse is the case. From twelve to fourteen girls outstrip boys in height, and from thirteen to fifteen they outstrip them in weight. After fifteen, however, girls grow slowly, and reach their full height at twenty; indeed many complete their full growth at fifteen or sixteen. On the other hand, boys grow more rapidly than girls after fifteen, and go on growing until about the age of twenty-three. Growth in height after seventeen, however, is very slow, and it is quite common for it to cease altogether at about this age. Until the age of twenty weight increases more quickly in winter, and height more quickly in summer.

As the weight has a tendency to increase with age after thirty, a certain allowance must be made for persons over and under that age. Three-quarters of a pound should be deducted for each year between twenty and thirty, and added for each year over thirty.

Women under 5 ft. 7 in. tend to weigh less for their height than men, but when taller than that they are likely to weigh as much as, or even more than, men.

Amongst the professional classes the average height is 5 ft. 9 in.; amongst clerks and shopkeepers the average is 5 ft. 8 in. Sailors, miners, and agricultural labourers come next, with 5 ft. 7½ in.; then the artisan classes, with 5 ft. 6½ in.; and, finally, come the factory hands and sedentary workers, with 5 ft. 6 in.

N. S. Neill, M.B.

HEALTH IN THE TROPICS

INTRODUCTORY

The object of the following pages is to give and explain the principles of health in tropical lands, and especially to give information for the benefit of persons about to quit a temperate climate for a tropical one, which will point out the physical differences between these climates, and endeavour to give advice which will help residents to live as healthy lives in the tropics as they did at home.

The plan followed will be, firstly, to consider the condition of the tropics and the mode of life usual there, and to point out the ideal mode of life; secondly, to give those methods of hygiene which are essential to good health; and, thirdly and lastly, to review the commoner diseases peculiar to the tropics, showing the means by which they are to be avoided.

The term tropics is very wide: from a geographical point of view it refers to lands lying between the tropics of Cancer and Capricorn—that is, lands within twenty-three and a half degrees of the equator: but, as we will show, the conditions which affect methods of life and health depend upon other circumstances more than they do upon distance from the equator. The two principal factors of tropical climate from the point of view of the likely effect which will be had upon those who have recently left a temperate zone are the temperature and the humidity of the atmosphere. By humidity we mean the amount of water-vapour contained in the air, for air acts towards water-vapour very much as a sponge acts towards water, being capable of holding any quantity up to a certain minimum quantity. When the air holds its maximum quantity of water-vapour it is said to be saturated, and the evaporation of water is impossible. These two factors, the degrees of temperature and humidity of the air, tend to be raised in hot climates, and, as will be subsequently explained, form the chief inconveniences to the inhabitants, particularly to the new-comers.

The heat of the body is derived from the chemical and physical reactions taking place between the body and the food and the air taken into it. In a temperate climate, such as that of England, the temperature of a person is usually from thirty to forty degrees higher than that of the outside air, and the body maintains its level temperature by giving off heat, because more heat is formed than is required to keep the person at that average condition of heat at which he feels most comfortable and the processes of his body are best carried out. As is generally known, this tendency of the body to part with heat may not, in a temperate climate, be given free play, and death from cold and exposure is the result, and it is guarded against by dwelling in houses specially heated, and constructed to retain their heat, and by covering the body in clothes made of substances which are bad conductors of heat. When a person comes to be in a climate where the temperature of the air and all surrounding objects is higher than that of his body, the state of affairs is greatly altered.

The three chief means by which the body parts with heat are: (1) By radiation, conduction, and convection; heat given off directly from the body surface to substances of lower temperature. (2) By the evaporation of water from the body surface; the perspiration leaves the pores of the skin as water and is taken up by the air as water-vapour. Water can only change into water-vapour by absorbing a very considerable amount of heat, the so-called latent heat, and in the act of perspiration the latent heat is supplied by the body. (3) By heating the air in the act of respiration and by giving off warm water-vapour in the expired air; this method being a combination of modes 1 and 2. The average temperature in the tropics is some thirty degrees higher than it is in temperate climates, and in the dry tropical plains, such as Northern India, it is even higher than this; thus, in a tropical climate, Nature's first means of giving off animal heat is seriously handicapped: for the body may even be of a lower temperature than the air and surrounding bodies, under which circumstances it will tend to receive more heat from them by radiation, conduction, and convection than it gives off to them: hence the need for mitigating this state of affairs by special clothing and means, blocks of ice and fountains being used to increase the number of objects of lower temperature, and clothing being worn which is externally coloured white and internally brown or red, so that the body's heat may be radiated off, and all heat radiated to the body may be reflected back as much as possible and not absorbed: moreover, Method No. 1 being rendered less efficient, more work is left for Method No. 2. Whether the evaporation of water takes place from the body or lung surface, the amount of water vaporised will depend upon to what extent the air is already saturated with water-vapour and also upon the amount of movement of the air: for the amount of evaporation will be greater proportionately to how often the more saturated layer of air next to the skin be removed and replaced by one saturated to a lesser degree, and obviously the more saturated the air the greater the need for movement of it, and hence in a low-lying, tropical locality, where humidity is great and breezes are few, artificial means of creating draughts are in vogue, such as punkahs and electric fans.

This subject of perspiration brings us up against the great difficulty of choosing clothing suitable for natives of a temperate climate while residing in a hot, moist one, in which the perspiration is a sensible one, and the skin becomes unpleasantly wet and feels uncomfortable; not as in a colder clime, where perspiration is insensible, the water being immediately vaporised upon being excreted by the skin, leaving the latter warm and dry. Linen garments become saturated and cling to the body, and they, being such good conductors of heat under these circumstances, make the wearer very likely to take a chill if he remains in a draught: thus, if linen garments are preferred, they will have to be changed many times daily. The ideal costume consists, as a rule, of undergarments made of a very thin, loosely-woven wool, of a dark shade, surmounted by a linen or silk suit, for outdoor use white, and for indoor coloured, either blue or kharki.

Effects of Heat and Humidity upon the Processes of Life and Comfort.—Providing that the air is comparatively dry a degree of heat such as is met with usually in the tropics does not have any ill effects upon health and comfort. Of course the quantity of insensible perspiration is enormously increased, but the effects of this are simply to cause increased thirst, to diminish the amount of urine excreted by the kidneys, and to decrease the appetite, especially for meats; this latter point is easily explained by the fact that the energy required by the body is to some extent given directly to it in the form of heat, and so the system is not called upon to manufacture so much: under these conditions just mentioned the individual would not realise any alteration in his degree of energy. If now, with the temperature remaining the same, the amount of water-vapour in the air were slightly increased and the air were put in motion by a breeze or punkah, the person would notice no change. But if the temperature being still unchanged, the degree of saturation of the air rise, the perspiration will become sensible and the clothes moist, and the person will no longer be comfortable, he will no longer feel that "it is a good thing to be alive," there will be a general lassitude, and no inclination to hurry or be keenly interested in affairs. Under these conditions, as an example of which may be cited Columbo during the hot season, there is great thirst, appetite is poor, and an inclination is felt only for hot and spiced dishes, and the ways of life are slow, no unnecessary exertion being taken. Being a maritime town, Columbo has, however, the advantage of the land breeze after sunset, which, as before said, will increase for the time the evaporating power of the air. To take our consideration of the effects of a condition of high temperature, degree of saturation, and movements of air to a logical conclusion, let us imagine that the temperature be tropical and the air stagnant and almost completely saturated—for example, as in a quiet corner of the stokehole of a steamship passing through the Red Sea in the hot season. In this situation a person would very quickly feel most uncomfortable, breathing would be difficult, the skin wet, cold, and clammy, and the body temperature very high, and the individual would soon faint from heart failure unless he were accustomed by a long apprenticeship to work under such conditions.

Heat Stroke.—The above considerations seem naturally to lead up to a consideration of the condition known as heat or sun stroke. Besides those rays emanating from the sun which have the power of burning and scorching, there are other rays, which have, especially in the vertical beams of the tropical sun, the power of passing easily through skin and bone and of producing on the brain some effect which shows itself as heat stroke: this is a serious and often a fatal disease in the tropics, and always demands immediate skilled attention, and is greatly predisposed to by previous exhaustion, either mental or physical, under this condition the ordinary means of protection from the sun's rays being of no avail. It must be always borne in mind that the head, back, or eyes must not be exposed to the direct rays of the sun, even a momentary exposure being sufficient to cause a severe headache in a person in perfect health. The best covering for the head is a special helmet made of a very light material and well ventilated; it should have a wide brim, and should be covered externally with white cloth, internally with red cloth, and the brim should be lined with green; if the back is likely to be much exposed to the sun's rays it must be protected by a special pad, white outside and green within, this pad being often attached to the helmet; the eyes must be protected by well-fitting sun spectacles of green or smoked glass, provided with shields. The early symptoms which urgently demand medical treatment are: headache, drowsiness, pains in the limbs, and cessation of perspiration.

The Tropical Day.—The day in the tropics, save in localities at high altitudes or well removed from the equator, does not admit of division in the same manner as is usual in temperate lands; the usual division is into morning, heat of the day, and evening. The midday heat commences between 10 A.M. and 11 A.M. and ends about 4 P.M., the time of greatest temperature being from 1.30 to 2 P.M.; during this time it is unwise to travel or in any way to expose oneself to the sun's rays. It would be preferable to spend it in taking a siesta, although it may be necessary to work during this period, but if so the work must be of some indoor variety.

It is usual to start the day with a light breakfast of the French type; to have the first meal about 10 A.M. when outdoor duties are finished, lunch about 1 P.M., and dinner about 8 P.M. Away from towns it is usual to rest entirely during the midday heat, all work being done before or after; but in the offices, &c. in the larger settlements work goes on, as a rule, during this time. In regions of higher altitude the mode of distribution of the day's work approaches nearer to that in vogue in Europe.

Tropical Seasons.—In the tropics the year is usually divided into the wet season and the hot or dry season: the nature and duration of these seasons depend upon:

1. Distance of locality from the equator.
2. Distance of locality from the sea.
3. Altitude of the locality.

(1) *Effect of Distance from the Equator.*—The nearer a place is to the equator the greater is the amount of rain which it receives. A town on or within two or three degrees of the equator has as a rule two wet and two dry seasons alternately, each lasting about three months, and is always subject to clouds and rain. As the distance from the

equator is increased localities are reached which are subject to rain for six months and a dry season of like duration. Further removed still, the wet season decreases in duration and the dry one increases, so that in the neighbourhood of the tropics of Cancer and Capricorn the wet season only lasts for three months.

(2) *The distance of a locality from the sea* affects and modifies the foregoing generalisations in the following manners :—A locality near the sea will be more subject to cloud and rain and the air will be more saturated with water-vapour than in a mid-continental neighbourhood, but it will possess an advantage over the latter in that it enjoys the effects of the land and sea breezes : the latter blows during the day, and being very saturated with moisture it increases the discomfort, but the land wind sets in after sunset. Feeling cold, this wind is grateful and pleasant, but must be treated with respect, as it is very likely to give chills to those who are lightly clad and whose garments are wet with perspiration. On the contrary, in a continental locality there will be much less cloud and rain, the air will be drier, and the district will be less prone to winds.

(3) *Altitude.*—The main effect of height is that the higher we rise above the sea-level the lower becomes the temperature : the so-called hill stations are very pleasant during the hot season because, in addition to this decrease of temperature, they are subject to winds, and if near to the equator to showers all the year round. During the wet season the rainfall is so great that they are well-nigh unoccupiable, being the places of greatest rainfall in the world.

Another factor which must be mentioned as affecting the climate and seasons is the condition of the neighbourhood as to whether it be flat or hilly : a mountainous district being greatly more subject to clouds and rain than a flat one. The existence of clouds in the tropics is important, because they prevent the usual nightly radiation of heat from the earth by reflecting it back again, thus rendering the night very hot, close, and unbearable.

With these general remarks concerning the climate of and mode of life in the tropics we must close this portion of our work. It is impossible in the scope of this article to review the localities of the tropical countries, laying down definite rules of life for each, neither can a dogmatic assertion be made concerning any one neighbourhood, as the varying height above the sea-level is a most powerful controlling factor in the determination of the climate. A reference to a good work on geography will give definite information as to the climatic condition of any place, and it is hoped that the preceding and following sections will give the necessary information regarding the mode of life and instructions for the maintenance of health.

An individual's state of health in a hot climate will greatly depend upon his knowledge of the principles of hygiene and upon the care with which he applies them to his daily life. At home in Britain and in most of the more civilised countries so much important public-health work is quietly done by the sanitary authorities that the individual is more or less ignorant of what work is done, and is unaware of the scrupulous care taken of water-supplies, drainage, &c., and when he finds himself in a land where the distribution of labour is less, the onus of the hygiene of his establishment falls upon him : moreover, he is in a land which is essentially much hotter, and consequently all processes of putrefaction are greatly accelerated, parasitic life more abundant, and the contagion of infectious diseases correspondingly greater.

Of late years hygienic methods have been very extensively applied in tropical lands, and some of their chief towns are models of ideal town-planning and drainage, although many have not yet lived down their well-earned names as abodes of disease. As an example of the effects of modern sanitation in a hot climate we might cite the present condition of that portion of the Isthmus of Panama which is by the canal. The work of cutting the canal was brought to a standstill by the ravages of malarial fever : the engineers turned their efforts to draining the land and removing undergrowth, and soon the malarial belt was a thing of the past, and the canal was finished, being a monument to the victory of sanitation. It is now generally admitted that with proper sanitation and careful mode of life there is no reason why a person should not be as healthy in the tropics as in his native land.

Before setting out for the tropics one will probably have to undergo a medical examination, but whether this be so or not it is very advisable that before going out one should be thoroughly overhauled. Of primary importance are the eyes and teeth, for abroad facilities for the special attention to these are less, and expenses for the same a great deal more ; moreover, there are certain diseased conditions which life in a tropical climate would tend to aggravate. These are, diseases of the heart, liver, and kidneys, and chronic indigestion ; also those persons who are of a gouty tendency would be best advised to avoid hot climates, and likewise those persons who are of a nervous or irritable temperament, for neurasthenia caused by living in high temperatures is a recognised condition, and the stolid and phlegmatic person is the ideal for acclimatisation there ; in addition, experience has proved that residence in a hot climate has an ill effect upon young and growing white children, and also upon white women at the time of the climacteric, and so these must be temporarily sent to a temperate climate. It has been stated that tropical climates have bad effects upon pregnancy and childbirth, but evidence to justify the acceptance of this as fact by authorities on tropical diseases is lacking.

HYGIENE

It is proposed to devote this section to considerations of the principles of hygiene, pointing out the sources of danger and laying down some simple rules for the preservation of health. We will treat of the matter by devoting a section to each of the most important subjects.

Water.—So uncertain is the source and supply of water in many tropical lands that often the only waters used for drinking purposes are the bottled table waters : these are waters that have been sterilised and aerated by some special process, and sometimes medicated, such as soda water.

The source of the water-supply is either from deep wells, the rain, or from the sea; the ships of His Majesty's Navy and some of the larger maritime settlements are mainly supplied with water obtained by a process of condensation from sea-water, and subsequently subjected to a process of aeration. In places where this water is unobtainable recourse must be had to rain or well-water, and during the dry season to the latter alone; these waters, no matter where the well be situated, or how carefully the rain-water be collected, are unfit for human consumption unless they are well boiled before use and carefully stored after thus prepared: neglect of this precaution being the usual cause of an outbreak of cholera, dysentery, or typhoid fever.

To be rendered completely sterile the water should be boiled for about fifteen minutes, and if all water to be used for drinking, cooking, cleaning teeth, and such purposes be first boiled for this period and be afterwards stored in perfectly clean vessels, all risk of infection with water-borne diseases will be avoided. An excellent method of storing water when boiled is in the jars made of porous, unglazed earthenware which are so common in the East, these vessels rendering the water cool by means of the evaporation which takes place from their surfaces. The jars should be scalded every three or four days with boiling water, and exposed afterwards to the sun; water must always be covered with a well-fitting lid when stored, to avoid pollution by flies or other insects, which is a source of danger.

A great quantity of ice is used in the tropics, and the source and the manufacture of this commodity is most important, because the freezing of water does not kill the microbes inhabiting it; thus it is essential that the water used for this purpose be sterilised and carefully preserved.

A few words concerning the use of filters is necessary; in so far as the idea that by filtration water is rendered fit for consumption is held must the use of filters be condemned. Certain filters, such as the Pasteur-Chamberland, do remove organisms from water, but these filters only work slowly when attached to a high-pressure water main, and thus in places where a considerable head of water cannot be obtained their use is out of the question. When one of these filters is used the porcelain cylinder must be removed and brushed daily, and must be boiled every three days. As regards the ordinary type of domestic filter, in which the water passes through a block composed of charcoal, oxide of manganese, or such substance, these are useless, and, in the words of one authority, they are "an unmitigated evil, in so far as they give rise to a sense of false security, which prevents the precaution of boiling the water being taken where necessary." If it be required to remove the visible impurities from the water this will be better performed by straining through muslin before boiling.

The Disposal of Refuse.—This is a matter of the most supreme importance in hot climates, on account of the rapidity with which putrefaction ensues. In the larger towns and settlements this work will be undertaken by the public authority, and there will be a drainage system and an efficient method for the collection and destruction of all waste matter. Nevertheless these public undertakings cannot be successful unless the authority receives the careful support and co-operation of the individual housekeeper, which is vastly more important in a hot than in a temperate climate, and which the authority has a moral right to demand.

The subject must now be more closely considered under the two following subdivisions:

1. *The Disposal of Human Excrements.*—In the large towns of India, the West Coast of Africa, and such places, modern drainage systems exist, and this being so the individual's duty is done if he carefully inspects the closets often, and assures himself that they are clean and in proper working order. In a place where a drainage system does not exist (and it must be remembered that a copious water-supply is necessary to render this efficient), the closet will probably be on the dry earth system. The principle upon which this method relies is that if excrement be covered with some two inches depth of any fine soil it will be completely destroyed by the action of microbes in about forty-eight hours, this result being of course quite frustrated if any disinfectant be used. The unfortunate part of the system is that the microbes are not destroyed, and the difficulty arises of how best to dispose of the closet soil. This soil must be removed daily; it may be disposed of firstly, if small in quantity, by spreading it thinly over agricultural ground, when germs will be killed by the action of the sun's rays; secondly, if in greater bulk, by carting to a distance from human habitation and burying—if this method be employed the closet buckets should be carted away undisturbed, and emptied only at their destination, where they should be disinfected and whitewashed before return; or, thirdly, by heat. During the wet season this substance cannot be disposed of in either of the above manners on account of the danger of infecting wells in the neighbourhood, and the only remaining method is by burning. With this end in view very little or no earth is used in the closets, the excrement being emptied from the latrine bucket on to the wood fuel of an incinerator, which is burnt nightly.

A very good substitute for earth when the refuse is to be burnt is sawdust mixed with a little crude creosote, which renders the mixture disinfectant, deodorand, and more combustible.

A special closet is obtainable in which the powder used is sprinkled over the excrement on pulling a lever. It of course goes without saying that this department must be well lighted and ventilated, and must be kept dry and scrupulously clean.

2. *The Disposal of Household Waste Matter.*—This important subject can be treated in very few words. All animal and vegetable waste matter must be burnt immediately, and while waiting destruction must be kept from flies or other insects. A small slow-combustion stove is usually used, all rubbish being put in at the top and the fire practically burning continuously.

Building.—Although the individual will not probably have much to do with the structure of his dwelling, yet it is essential that he comprehend the important points thereof from the point of view of effect upon health. The dwelling-house in use in hot climates is as a rule of the one-storied type, standing in an enclosure, the compound, in which are the garden, the outhouses, and the quarters of the native servants. The compound should not contain shrubbery or long grass near to the house, as this harbours snakes and other vermin.

The surface of the ground upon which buildings are erected should be covered over with concrete, and either this should form the floor surface or wooden blocks fastened to it by some resinous cement. If an ordinary boarding floor be used on account of cheapness, it must have an air-space between it and the concrete to prevent the occurrence of dry rot, and this space must be sufficiently deep to enable it to be easily cleared out, to avoid it becoming the home of rats, snakes, &c. The floor should be at least some foot or more above the ground level, and the walls must be provided with a damp-proof course between the ground and floor levels. The house should be surrounded by a verandah over which the roof projects; this must be sufficiently wide to prevent the sun's rays from reaching the walls or windows, and the surface of this verandah must be of a dark-red or similar colour to prevent the light and heat being reflected on to them. The external and internal surfaces of the walls should not be painted white, as in the intense light this colour gives an unbearable glare, some light shade of green, blue, or pink being preferable. Rooms must be lofty, and the roof should be double, with a well-ventilated air-space between the outer and inner roofs, and there should be means for hot air to escape from the room into the between-roof space, from which some method of air-extraction must be supplied: doors and windows must be provided with sun blinds or screens of some description.

The kitchen, pantry, and other culinary departments should be as far as possible removed from bathrooms and closets, these latter being most suitably situated in an annexe reached by a well-ventilated passage. If possible the bedrooms and portions of the verandah should be rendered fly-proof by means of the special mosquito-proof gauze, and all beds provided with mosquito curtains: the principal rooms will require some artificial means of producing a draught, either by means of electric fans or punkahs, or the ordinary punkah, which is a large fan attached to the ceiling worked by the hand of a servant from outside the room. Many of the larger establishments are cooled by a more elaborate method: the air, first cooled by being blown over blocks of ice, is blown into the room through an ornamental grating, which serves as the cornice, and thus a shower of cool air falls upon the occupants. The air of a room may also be cooled by standing blocks of ice about, this method being much used in offices. In choosing a house the site should be as high as possible, for on this depends dryness during the wet season, the greatest amount of breeze, and the most efficient drainage.

Ventilation.—In lands where windows are large and these and the doors are seldom closed there is plenty of opportunity for the frequent changing of the air of rooms, providing that a breeze or one of the above-mentioned means of causing draught exists. In larger buildings, where many people are likely to gather together, some special means of drawing off used air must be employed, such as extraction by electric fans.

Heating and Lighting.—Artificial heating of houses requires no special mention, because when necessary it is performed by means of one of the methods in vogue in colder lands. We must remind readers that charcoal braziers give off poisonous fumes, and should only be used in well-ventilated rooms.

Wherever practicable the best means of lighting is undoubtedly the electric light, because this light does not vitiate the atmosphere, and generates less heat than any other.

Exercise and Clothing.—Exercise has already been treated of, and but little remains to be added. As little physical exertion as possible must be taken during the heat of the day, travelling being done by night whenever convenient, and social duties and outdoor games being relegated to the cool of the evening: a bath and rub down should be taken, and dry clothes be put on as soon as possible after exercising.

Suitable clothing for the hottest places has been already mentioned, but dress must depend greatly upon personal peculiarity and locality; it being remembered that in high altitudes the nights tend to be cold. We have already discussed the necessity for sun helmets and back shields, but there remain other dangers in the tropics which require precautions by means of special clothing. These are, firstly, the bites of mosquitoes and other kinds of flies, which are of particular danger in marshy and maritime localities. These insects are troublesome during the evening and night: the precautions are fly-proof verandahs and bedrooms and mosquito curtains. The latter consists of a net of very fine mesh which is hung as a tent over the bed and is tucked well in below the mattress: it is important that the net be well tucked in during the afternoon, before the mosquitoes leave their haunts. If marshy places, such as mosquitoes inhabit, have to be visited, specially made clothing must be worn, *i.e.* mosquito boots, well-fitting putters, gloves, well-fitting wristbands, and mosquito veils. Secondly, the bites of snakes; in the day such are to be found in cool dark places, in long grass, and in the jungle, which at night they leave for the open, so that when going on foot at night it is advisable to carry a lantern and to wear stout boots, puttees, and breeches; and, lastly, the bites of such insects as bugs, fleas, ticks, and jiggers, of which more anon under the heading of Animal Parasites, and the protection against which will be then mentioned.

Food and Cooking Methods.—In hot climates fresh meat is not easily procured, neither is it very greatly desired, save as an occasional change. Cooked meals must be eaten the day that they are prepared, because, as already stated, putrefaction is so very much quicker in hot climates that they will only keep for a few hours, and thus, in addition, what is not consumedhad best be quickly destroyed. Preserved meats, such as those which are preserved by heat and sealed in tins and are exported from temperate lands, are more handy, and are in the majority of cases preferable to native meats, providing that they are made by reliable firms and are recently opened before use.

Vegetables to be eaten uncooked as salads or jellies must be carefully washed before use. The consumption of these articles of diet in a hot climate cannot be advised, and in times of prevalence of typhoid, dysentery, or cholera they must not be taken. Only fruits which are perfectly ripe should be eaten; these should be washed before being served, most especially those of which the outer surface is eaten. A newcomer to the tropics would be well advised to proceed warily as regards the local fruits until he has settled down for a week or two and has become used to the new mode of life.

Milk keeps very badly in hot climates, and most easily becomes a source of infection by dust or insects entering it: it should always be boiled immediately upon reception, and unless used straight away should be stored in recently boiled bottles which are fitted with stoppers, and be placed in the ice chest until wanted. As regards beverages, care of the water has been already mentioned, and the superiority of properly prepared table waters for consumption has been pointed out: to this it remains to be added that as small an amount of liquid as is compatible with comfort should be taken during the heat of the day, and alcoholic liquids should not be taken before the cool of the evening. The alcoholic drinks most used in the tropics are spirits and the lighter wines, malted liquors being too productive of heat.

As regards cooking, the most important details from the point of view of the present treatise are, firstly, the immediate destruction of all waste matter, that insects be neither attracted nor harboured; and, secondly, that all utensils be properly cleansed. It must be borne in mind, that apart from actually drinking impure water, a person is liable to infection if utensils are washed in it, or if he use it for cleansing his teeth, &c.: thus all water used for these purposes must be strained and boiled before use, unless, as mentioned under Water, a Pasteur-Chamberland filter can be used, which is unlikely. It is advisable that all utensils be washed in hot water and soda, be then rinsed in boiling water and be kept exposed to the sun in a fly-proof compartment; if an ice chest be used it must be turned out and cleansed every three or four days and be exposed to the sun's rays for a few hours before re-use.

TROPICAL DISEASES

We now come to the most important portion of our work, viz., brief accounts of the sources and modes of infection of the most serious of the diseases which occur in the tropics, and the means by which they may be avoided. This is important not only from the point of view of the individual, but because the only way in which these complaints may be stamped out is by the laity possessing accurate knowledge of the subject and freely giving intelligent co-operation with the medical authorities.

These diseases are interesting from the fact that cause and effect are pretty plain now that modern scientific methods have laid them bare, and in that the organisms causing these diseases are in the majority of cases communicated to the patient by, and only by, insects.

We will treat the diseases alphabetically, and consider each from the point of view of the nature of the disease, the source of the causing microbe, the method by which the microbe reaches his victim, and the means by which this transmission may be avoided. These are all diseases of the so-called specific variety, which means that each is only caused by some particular microbe which is scientifically recognisable.

Cholera.—In this disease the causal microbe exerts its ill effects upon the animal economy by gaining entrance to the intestines, where it flourishes, producing poisons which poison the patient, and causing a serious and often fatal disease characterised by diarrhœa and cramps.

The source of the organism is the excrement of some person suffering from the disease: the transmission of the disease takes place in one of two ways usually, both of which originate in carelessness in disposing of the motions of cholera patients; either the motions are thrown upon the ground and the microbes infect the water source of some well or the motions are left about exposed and some insect feeds off them and then wanders on to food or milk, which are improperly left uncovered, and thus the disease may easily become epidemic unless care is taken.

The precautions to be taken are fairly obvious. Patients suffering from diarrhœa must be treated with suspicion until a satisfactory diagnosis is made, and all cases of cholera must be kept in an isolation hospital until their motions cease to be infective; the motions of patients should be mixed with carbolic acid as soon as they are passed, must be covered up until the doctor has seen them, and must then be burnt as soon as possible. During the prevalence of the disease all water for domestic use and milk must be boiled, and both these and food must be most scrupulously preserved from contact with insects, and no uncooked vegetables or fruit must be consumed.

In addition, extra vigilance must be taken in the way of frequent inspection of the sanitary and cooking departments of the house to see that they are properly kept, and any cases of diarrhœa among the kitchen staff be submitted to examination.

It is possible to be vaccinated against cholera, the immunity thus produced lasting about a year: this is an advisable precaution to take during a severe epidemic.

Dysentery.—Under this title a collection of similar diseases are known; they are due to the presence of microbes within the intestines, and the outstanding features of the disease are diarrhœa accompanied by much straining, and the passage of blood in the motions: each type of dysentery being caused by its own special organism.

The source and methods of transmission and prevention of this disease are the same as for cholera save that vaccination is not in vogue against it.

Leprosy.—This disease is deserving only of passing notice, inasmuch as it is scattered pretty generally over the tropics.

The source of the organism producing this disease is the secretion of a sufferer, especially the nasal secretion, and the method of transmission is by actual contact, and so the risk of infection is slight, providing that proper attention be given to personal cleanliness.

Malaria.—This is a disease caused by the presence in the blood of certain organisms, the growth of which in this situation gives rise to certain definite feverish symptoms, varying with the causal organism, of which there are three chief types, each of which causes a particular type of malarial fever.

The source of the microbe is thus the blood of a person suffering from malaria.

The mode of transmission is by the bites of mosquitoes. The method in which this takes place is the following: A mosquito chances to feed off the blood of an infected person and when afterwards it feeds off the blood of other persons it accidentally infects their blood with the microbe which it has thus obtained.

The Methods of Prevention.—Malaria is so widespread a disease that it is impossible to isolate all infected persons, because in malarial regions great numbers of the natives have the organisms in their blood without seeming to suffer any extreme inconvenience. The most important method is by the destruction of mosquitoes. This undertaking is more practicable than it at first sounds, because the mosquito breeds in marshes, and so if these are drained the supply of mosquitoes is greatly reduced; if drainage of marshes be impossible there is yet another means at our disposal, because in the larval stage the mosquito is an aquatic insect, and either fish may be introduced which live upon larvæ, or the larvæ may be poisoned by periodically pouring kerosene upon the surface of the water during the larval season. The above methods are of course only the work of public authorities, the individual's care must be devoted to seeing that they have the necessary means at their disposal and that his residence is as far removed as possible from low marshy lands, that special protective clothing is worn when exposure to mosquitoes is likely, and that the mosquito curtain is sound and is well tucked under the mattress during the heat of the day before the mosquitoes are about.

As a protective drug during epidemics a tablet containing five grains of quinine hydrochloride should be daily taken immediately after dinner.

Parasites.—Under this heading let us first repeat what has been said of these creeping or hopping insects which live upon fresh blood. We have noticed that the great danger of the bites of these insects lies in the chance that disease germs may in this manner be carried from the ill to the well. The insects exist on both persons and animals and both in and out of doors, and are known by many different names in divers places. The chief varieties are fleas, bugs, lice, sand-bugs, and sand-fleas or jiggers. The avoidance of the indoor variety is to be by avoidance of dirty dwellings and native quarters and the careful fondling of animal pets, and of the outdoor variety by wearing well-fitting boots and puttees and by keeping some boracic acid powder in the boots and being particular not to sit or lie upon the ground; camp beds and chairs being always taken upon expeditions.

And now a word or two concerning those animal parasites usually known as "worms": of these the varieties are legion and differ with the region, and a full consideration of them all is beyond our scope; suffice it here to say that they one and all enter the human body with either food or drink, and if the precautions recommended under those headings be taken, the individual will be safe from infection.

The eggs or embryos of these worms can exist without being digested in the human stomach, and on reaching the intestine each develops according to its kind, and thus the tapeworm lives quietly in the intestine doing no more harm than to rob its host of some of the nutrition of his food, whereas the "worm" known as Agchylostoma duodenall, which occurs in hot moist climates and in deep mines in temperate climates, lives in the intestine upon the blood of its host, causing a serious and often fatal anæmia, the so-called "Miner's Anæmia": on the other hand, when the embryo of the "worm" known as Echinococcus reaches the intestine it develops, and then eats its way out of the intestine and forms bladder-like swellings in different portions of the body. This worm being most prevalent in dogs and such animals, they should not be allowed to defile any vegetable food which may possibly be eaten uncooked, and also the embryo of the "worm" known as Dracunculus, having developed in the intestine, eats its way to some situation under the skin, usually of the feet or legs, where it is known as the Guinea-worm and is very hard to get rid of. This will give the reader some idea of the diverse behaviour of the parasitic animals, and will show the necessity for the scrupulous care recommended regarding articles of diet.

Plague.—This disease owes its origin to a special organism gaining entrance to the blood-stream, from which it enters and causes diseased conditions of different organs, either the lungs, where is produced a condition similar to pneumonia, or the lymphatic glands, when it produces the type of plague known as bubonic, or it may cause a condition of fatal blood poisoning: plague being classified according to which organ is chiefly affected.

This disease differs from the preceding ones in that it is known to affect the lower animals as well as man, and is most prevalent in rats.

The source of the organism is the blood of a person or rat suffering from the disease: it is transmitted from one subject to another by the bites of the rat-flea, this flea carrying the infection in the same manner as the mosquito carries the malarial organism.

Prevention.—The public authority must be acquainted with the ports in which the disease prevails, no person being admitted from an infected port without being carefully examined, and all ship-rats on vessels coming from the infected ports being destroyed before the ship berths; all infected persons must be isolated in hospitals and all possible precautions against the persistance of rats be taken: samples of the rats being frequently examined for the plague bacillus.

Private persons must see that their houses are constructed and maintained so that rats are not harboured, and rats must be periodically destroyed, a good method of doing the latter being by means of the new virus which kills off rats by means of an infectious disease to which human beings are not subject: care must be taken during a time of prevalence of plague to keep away, so far as is possible, from native quarters and to avoid fondling dogs and cats, which may have become contaminated with infected fleas from having indulged in a rat hunt.

Relapsing Fevers.—Under this term is known a collection of different simple fevers; the particular type varies with the locality, but practically every tropical land possesses one, usually spoken of as simple fever; when once infected with the disease an individual is always prone to an attack of it if he takes a chill while rather run down in health; in the common parlance he has a "touch of fever."

The source of the organism is in every case the blood of an infected person or animal, and the infection is transmitted by the bites of bugs and ticks, the method being similar to that of the transmission of plague by the rat-flea.

All that can be done in the way of prevention of infection with one of these diseases is to preserve the person, so far as possible, from the bites of insects in the manners before mentioned, and by treating the disease as infectious, disinfecting the room, bedding, and clothes used by an infected person, by sealing up the room and burning a formaline lamp in it, and those attending on patients taking care not to carry insects about on their persons.

Sleeping Sickness.—This serious and usually fatal disease is practically peculiar to equatorial Western Africa, although it seems to be spreading eastwards. It is caused by the presence in the blood of an organism which has serious effects upon the nervous system.

The source of the organism is thus the blood of an infected person, which is carried by a fly as malaria is carried by the mosquito; the offending insect in this case being the tsetse fly, which abounds in infected neighbourhoods in the vicinity of water and shrubs, particularly in places where the crocodile is common, as this fly lives mainly upon the blood of that animal.

Attempts to prevent this disease must devote themselves to the careful collection of persons suffering from the disease and keeping them in a neighbourhood where the fly is rare, and preserving them from the reach of flies by using mosquito curtains and flyproof buildings.

Localities inhabited by the tsetse fly should be avoided, and if this be impossible the precautions against the bites of flies mentioned above must be carefully followed and houses rendered flyproof by means of special fine wire gauze being stretched over verandahs, windows, and doors. The native quarters should be well separated from the residence, and all bush growth for some five hundred yards around be destroyed.

Snake-bite.—We have above mentioned the special precautions that must be taken to avoid the danger of being bitten by a poisonous snake. Although death from this cause is happily rare among the European residents and better-class natives, who go about clad in protecting garments, it is unfortunately common among the lower classes who go with bare limbs, often sleep on the ground, and to whom some snakes are sacred creatures, and as such are encouraged to enter the natives' dwellings.

The variety of poisonous snakes varies with the district, but we are safe in stating that no tropical land is free from them, and a newcomer will soon be well informed on the subject by the old timers. The poison of each snake has its own peculiar method of causing death, but the discussion of this point is beyond our present scope and is also unnecessary, as the main treatment for all is the same.

Snake-bite being a possible misfortune for all and a probable one, sooner or later, among one's native servants, it is deemed advisable that all should possess the knowledge of what is the best immediate treatment under the circumstances.

When a snake strikes and hits, its venom is injected into the small puncture-like wound which its teeth makes, and, unless prevented, the poison will thence be absorbed and will find its way into the blood of the veins with which it will reach the heart and system, upon which it produces effects varying with the kind of snake and amount of venom absorbed, which, if the quantity be sufficient, will cause immediate death. In the event of a case occurring, efforts must be firstly directed to prevention of the flow of blood from the site of the bite; secondly, to the removal as far as is practicable of the venom from the bite, so that the least possible amount be absorbed; and, lastly, to the counteraction of any signs of collapse which show themselves. Thus, when an individual is bitten our first aim must be to stop the flow of blood in the veins leading from the situation of the bite to the heart; this can only be done when the bite is on the limb, and fortunately the great majority of snake-bites are on the feet or hands; the method of doing this is as follows: A strong ligature, either a bandage, belt, puttee, strip of shirt, or any other such article handy must be very tightly placed round the limb between the bite and the body; this ligature must be placed round the thigh or arm respectively, because the leg and forearm, containing each two bones, the circulation cannot be here arrested by pressure; the ligature being applied, our attention must be now turned to the bite; here a cut must be made in the direction of the length of the limb, this cut being some three inches in length and about half an inch in depth, and having the bite as its centre; the cut must be well opened to cause as much bleeding as possible, and must be well washed out with a solution of potassium permanganate, made by dissolving two teaspoonfuls of this salt in a tumblerful of water—if water cannot be obtained, the wound must be well rubbed with the salt itself: when the bite has been thus treated for some five minutes, the ligature must be loosened for some ten seconds and then retightened, lest injury be caused to the limb; the ligature should be thus left on the limb, being slackened for a few seconds every five minutes, until skilled attention be procured; if a medical man cannot be obtained it should be cautiously removed at the end of three-quarters of an hour, the effect upon the patient being closely watched.

The possible signs of collapse referred to as likely to demand attention are failure of the heart's action or of the breathing: if the patient be faint, he must be given some brandy and be laid on his back with his head low; if this be of no avail, an attempt to increase the amount of blood in the heart and brain can be made by tightly bandaging the limbs and abdomen and by raising the limbs; if the breathing seem to be failing, artificial respiration must be resorted to.

From what has above been said it is obvious that an emergency case containing potassium permanganate must be carried whenever any expedition is taken which is going into the underwood or through long grass: special cases are on the market which contain the requisite knife, ligature, and tablets of potassium permanganate.

The antitoxin for snake-bite must be mentioned, because an antitoxin can be prepared for the venom of any particular snake—unfortunately an antitoxin can only neutralise the toxin for which it was made, is extremely difficult to keep, and quickly deteriorates and is required in considerable quantity. This method of treatment is thus out of the question as regards first-aid but is possible in hospitals, and thus, if a hospital be near, the body of the offending snake is necessary as being the guide to the kind of antitoxin indicated.

Typhoid or Enteric Fever.—Although this disease is not peculiar to the tropics, it is so much more common in hotter climates, and its dissemination is there so much easier, that it must be mentioned. It is caused by the presence in the blood of a special microbe which chiefly exerts its ill effects upon the intestines, in which it produces ulceration, usually causing diarrhœa: the organism leaves the body in the urine and motions of the patient.

The source of infection is thus the urine and motions of sufferers from the disease which are not properly disposed of and which will infect water-supplies or food in the same manner as do the ejecta of cholera and dysentery patients, and the methods of prevention are precisely the same as for these diseases.

Yaws.—This is an equatorial disease which is most commonly found in the East Indies, but which is also known in Asia and India. It is a very infectious disease, being of the same family as syphilis; the particular microbe enters the system through an abrasion of the skin and thus starts a disease which runs through different stages, and though not often actually fatal, is most hideous and difficult to cure.

The sources of infection are the excretions and discharges of an infected person, and the disease is transmitted by contact with the same or with articles contaminated with them, the infection often entering through a scratch so trivial as to have been treated with indifference. For prevention of the disease all patients suffering from it should be isolated in hospitals until cured, where all articles which they infect will be destroyed: in places where the disease is common, all cuts and scratches must be treated seriously and be kept well protected with antiseptic dressings.

Yellow Fever.—This still somewhat obscure disease is commonest on the West Coast of Africa. The origin of infection is the blood of a person suffering from the disease which then contains the causal organism. The mode of transmission and the precautions for prevention of this disease are similar to those for malaria save that the carrier is a mosquito of a different family, so that it is unnecessary to repeat, and we refer the reader back to the article on **Malarial Fever.**

CONCLUSION

In conclusion let us summarise the most important things. We have pointed out that lands nearer to the equator, at sea-level, vary from those further removed therefrom in the arrangement of their seasons, in the temperature of and amount of moisture in the air, and the manner in which these altered circumstances affect the economy of life, rendering acclimatisation necessary to one coming from a temperate land: that this acclimatisation is quite possible, and that if one takes sensible precautions against heat and moisture there is no reason why good health should not be maintained. Nevertheless, just as the natives of the tropics are not so energetic as natives of colder lands, so a white man must not expect the same work capacity while resident in a hot climate that he had in his native land: also that near the equator, if the district is hilly, a climate as endurable as the temperate may be procured by going to a hill station.

We have considered the principles of hygiene bearing upon our subject, both from the point of view of the community and of the individual, showing that tendency to putrefaction varies directly as temperature and moisture, thus making precautions to ensure purity of water, milk, and food even more essential to health in a hot than in a cold land; that the proper destruction of refuse is extremely important, and that the less be the civilisation of a neighbourhood the greater is the individual's responsibility.

We have likewise discussed the commonest of the serious diseases found in the tropics, showing their method of infection and pointing out that they are all capable of avoidance, the essentials being strict cleanliness and care of the person from filth and the bites of insects, and scrupulous care in the preparation of food and drink, all water and milk being boiled, all meat being fresh, and uncooked fruit and vegetables being sparingly partaken of at any time and not being touched in a neighbourhood where an epidemic of cholera, dysentery, or typhoid exists.

G. F. Oldershaw, M.D.

THE CULTURE OF HEALTH IN COLLECTIVE LIFE

INTRODUCTION

Man is a gregarious animal, and from time immemorial he has gathered together into communities. He has had to pay the penalty for this in a greater liability to disease in its multifarious forms. But this is, to a large extent, because of the neglect of most important sanitary considerations. The increasing adoption of hygienic measures in connection with towns has resulted in a marked lessening of the general death-rate.

We propose to consider the subject of this article under the following subheadings: (*a*) Water-Supply, (*b*) Food-Supply, (*c*) Removal of Waste Products, (*d*) Town-planning and Housing; and finally we will deal with (*e*) Disease as it affects mankind in the mass, discussing shortly the causes of epidemics, and indicating what steps are taken to limit the spread. The question of diseases associated with or attributable to various forms of industrial enterprise will also receive consideration.

WATER-SUPPLY

Probably the most important consideration in relation to the health of a community is an adequate supply of pure water. Pure, because impure water is the cause of much disease; adequate, because a shortage in the supply prevents the efficient removal of filth and the cleansing of premises, &c., properly, and thus must lead to a deterioration of the general health. It has been calculated that about 30 gallons of water per head per day are necessary to obtain an adequate supply. This amount is accounted for as follows: 1 gallon for drinking and cooking purposes, 3 gallons for ordinary personal washing, 4 more gallons for baths, 3 gallons for domestic washing, and 6 gallons for water-closets; 3 gallons should be allowed for unavoidable waste. In addition to this supply for the house, it is reckoned that 3 gallons per head per day are required for animals, and 9 gallons for general public purposes, such as watering of streets, public baths, &c. To obtain and maintain this amount entails some very difficult problems in many towns.

Source.—For towns there are two main sources of supply, and the choice must usually be limited by the situation of the place. Where possible a supply derived from an upland surface is the most desirable, especially where this is a barren area. Such water is about the purest obtainable owing to the lack of rank vegetation, and the absence of sources of pollution. The rain falls through pure air on to clean ground, and collects into a lake, whence the supply may be derived. In other cases an artificial lake has to be formed by building a water-tight dam across a valley, and thus imprisoning the waters which drain into it. In such cases means should be taken to prevent the entry of the turbid waters which rush down from the watershed after a heavy rain-storm.

The other chief source of supply is from a river. Such water is nearly always polluted, for, in addition to draining cultivated land which has been manured, it has frequent additions in the form of sewage from various towns and villages on its route. Obviously such water is unfit for consumption without further treatment. The water should be withdrawn from the river above the town, at a place where there is a good depth and a good flow, by means of a submerged sluice. This prevents the entrance of gross floating particles. Such water usually requires to be stored in deep reservoirs for some days so that much of the suspended organic and other matter may settle. The clear water on top should then be conveyed to a shallow reservoir, where it is purified by filtering through sand, &c. This filtered water is then pumped up to a service reservoir at a sufficient height to obtain the necessary head for supplying the various districts.

Smaller communities usually have to resort to other means of obtaining water—*e.g.* springs, wells, rain-water.

Spring water may be pure or otherwise according to the character of the ground on which the rain falls or the soil through which it percolates. If the surface of the ground were polluted with decaying animal or vegetable matter and the soil were gravelly and shallow, much of the organic substance would be dissolved in the water and pass into the spring. On the other hand, water which has filtered through chalk has usually passed through a thick layer before reaching an impervious stratum, along which it runs to crop out elsewhere as a spring. Such water would be pure, even if it had become polluted on the surface, owing to the efficient filtration through the bed of chalk—of course this is supposing that no fissure were present in the chalk which would permit polluted water to sink down immediately to the level of the spring, and so contaminate the supply.

Wells are the most common means of supply in rural districts.

Shallow wells, *i.e.* those which receive the water which collects above the first impervious layer of soil, are usually of questionable purity, owing to the frequency with which their neighbourhood is contaminated by the presence of dirty yards, leaky cesspools, &c. Water passing through such areas becomes grossly polluted, and drains readily into the well. In the majority of cases the radius of the area drained is equal to at least four times the depth of the well; this is increased if the well is heavily pumped.

To ensure a good supply from a shallow well there should be at least one acre of unpolluted ground surrounding it. It should be properly constructed of brick and well puddled to prevent water near the surface trickling in. The walls should rise above the ground about two feet to avoid surface washings, and there should be a good covering to protect it.

Deep wells are those which pass through the first impervious layer and receive water which collects above the second. Such water has fallen on to ground a good distance away, and even if initially polluted has largely been purified by filtering through so much soil. A deep well should also be well constructed to prevent water entering through cracked walls, &c.

Artesian wells are similar to deep wells, only the water flows out over the surface of the well.

Rain-water in country places may prove an important auxiliary source of supply. It should be stored in properly ventilated watertight cisterns underground.

Distribution.—The water leaves the lake or reservoir by means of a submerged outlet pipe, which is bent upwards to avoid floating particles. This carries it to the aqueduct, which may be an open channel, but is usually formed of iron pipes buried underground. Every here and there are openings for cleansing the pipes. Distributing mains conduct the water along streets. These pipes should be placed as far as possible from sewers and gaspipes. Service pipes conduct the water from the street main to the house. All these pipes should be made of iron, the inner surface of which should have been so treated that it does not rust. Owing to the many bends in pipes in houses they are often made of lead, but this should not be allowed if the water is very soft or comes from a peaty area, as a certain amount of lead is then dissolved, and this would lead to poisoning.

A stopcock, easy of access, should always be placed on the pipe just after its entry into the house, so that the water can be easily turned off if necessary. Water should be carried to every floor of the house, and there should always be a cistern at the top to supply the boiler, &c.

Water is mostly served on the constant system, and this is very much the best plan, for it is always available when needed, and no large cistern is necessary, but it requires the use of good fittings to prevent leakage. Where there is a scarcity of water the intermittent system of supply is adopted. In this the water is only turned on for so many hours per day. This makes it necessary for every household to store enough water for twenty-four hours, and consequently the cisterns have to be large. They are apt to become foul, while the water tends to become stagnant and absorbs impurities from the air. In the event of fire breaking out there is a further drawback owing to the inability to get a sufficient supply of water. Its only advantages are a little less waste and less costly fittings.

There should always be one tap giving water direct from the main for drinking purposes. The rest may be drawn through the cistern at the top of the house. The cistern should be made of galvanised iron and should be covered over, but means of ventilating it should be present. It should be cleansed once a year.

The supply to the closet tank should come direct from the main and not through the cistern.

Impurities in Water.—These may be of various kinds—suspended or dissolved mineral or organic matter. The latter may be of vegetable or animal origin. Such impurities may be derived from the source of the supply or they may be gained in transit to reservoirs, or in storage in wells, tanks, or cisterns, &c., and finally in some cases impurities are sucked into the pipes concerned in distributing the water.

Diseases Caused by Water.—The presence of much suspended mineral or organic matter often gives rise to diarrhœa, apart altogether from what may be caused by the presence of germs from sewage; but the most important causes of disease are the presence of various microbes, more particularly those associated with certain specific diseases. Of these, enteric fever, cholera, and dysentery are the most striking and common examples.

The presence of an excessive amount of dissolved mineral matter may lead to dyspepsia as well as producing diarrhœa.

Goitre seems also to be associated in some way with the drinking of water containing an excessive amount of certain salts.

Lead poisoning has resulted from the constant drinking of small quantities of lead dissolved by the action of soft or peaty waters on lead pipes.

Purification of Water.—Many waters which are quite pure are objectionable owing to their extreme hardness, due to the presence of certain salts, and these, besides giving rise to gastro-intestinal derangement, are undesirable from economic reasons. Consequently various methods of softening have been advocated which have as their object the removal of much of the lime salts causing the hardness. The basis of all the methods is the addition to the water of a given quantity of milk of lime, the amount depending on the degree of hardness. This removes a considerable degree of hardness in the form of chalk. The remainder constitutes the permanent hardness, and this may also be removed by further treatment with sodium carbonate.

Few sources of supply are so pure that the water can be imbibed without further purification. Many methods have been advocated and carried out to remove the dangerous elements. The storage of water in reservoirs for several days has been found to be very effective as a preliminary measure of purification. Following on this, the use of one of the various methods of removing impurities by mechanical means is frequently adopted. Of these the most common system is that of filtration through sand. A bed of sand, the finer on top, about 3½ feet thick, is superimposed on a 2 feet thick layer of gravel. Underneath this are drains for collecting the filtered water. Water is passed on to this filter bed until there is a depth of 3 feet. The rate of filtration should not exceed 4 inches per hour. Such a procedure removes about 98 per cent. of microbes, and thus yields a very pure water. On the surface of the sand a slimy layer forms, and it is this layer which is so effective in removing the bacteria. When the filter begins to get relatively clogged it requires to have the top half inch scraped off. This renews the filter.

This method is relatively slow, and much expense of time and money is incurred in cleansing the filter, so that other means have been devised of securing as good a filtrate more rapidly. Most of these methods depend on the addition of some chemical to the water before filtration takes place. Examples of such efficient filters are the Bell patent filter, the Candy filter, and the Ferrochlore process.

Such methods refer mostly to filtration on a large scale, but for purifying water for domestic use, such as in a rural district with a shallow well supply, other means must be adopted.

When drinking water is obtained from a possibly contaminated source, almost the only satisfactory means of getting rid of germs is the use of an efficient filter made of clay or porcelain or similar material, such as the Pasteur-Chamberland or the Berkefeld filter. These are moulded into the form of a hollow candle, and can be made to fit on to a tap, or several may be fixed into a large receptacle and connected with an outlet for the pure water. The filters act merely as mechanical obstructions to the passage of germs. After a time they begin to get clogged, and required to be cleaned by rubbing or brushing the surface under water. This proceeding, by removing part of the filter, gradually makes it less effective, but with care such an instrument ought to last about two years. They are largely used in the army, where they have been found very effective. Candles made of the coarser clays and infusorial earths are not absolutely impervious to the passage of bacteria, but it takes several days for, *e.g.*, the typhoid bacillus to penetrate right through. In consequence the routine practice in the army is to boil the candle in water every three days. This kills any germs which may have entered the substance of the filter.

Other means of purification of water consist in boiling it. This is always effective, and nearly always to hand, but it renders the water unpalatable owing to loss of the dissolved gases.

Still other means are the addition of chemicals. These may act either by producing a precipitate which carries down suspended matters and bacteria as it subsides; or by preventing the growth of germs, &c. *e.g.* the addition of copper salts to the water has been found very effective in removing various algæ and other plants, which by growing in reservoirs impart a nasty smell and taste to the water; a dilute solution of chlorine has also been found very effective in killing off bacteria.

In rural districts water which is obtained from a shallow well should be either boiled or passed through a Pasteur-Chamberland or similar filter before being consumed.

FOOD-SUPPLY

In considering the welfare of a community the food-supply must necessarily occupy an important place. The supply ought to be adequate not only in amount but in quality. A deficiency in amount leads to malnutrition, which affects the physique of the race. A lack of certain of the elements leads to the development of disease, and this is particularly exhibited in such disorders as rickets and scurvy. But the chief supervision over the supply should be to ensure that only that food which is pure is allowed to be sold for human consumption.

Impure food is the cause of much disease. This may arise through the putrefaction of articles of diet which were previously wholesome, or through the development of some poison in the food, or from the presence of parasites. Poisoning may also arise from the absorption of metals in tinned goods, and disease may develop owing to the presence of preservatives, especially if in excess.

Space being limited, we are only able to enter into details concerning a few of the most common foodstuffs.

Meat.—It is essential that this should be pure. Good meat should be firm and red throughout, and free from unpleasant odour. Pork and the flesh of young animals, however, is pale.

When meat is commencing to putrefy it turns paler, begins to smell slightly, and loses its resistent feel to pressure with the finger, leaving a permanent depression behind. In a state of further putrefaction the meat turns greenish, and the unpleasant smell becomes more pronounced, especially if the meat has hot water poured on to it. Tainted sausages, if chopped up and soused with hot water, yield an unpleasant odour.

There are numerous instances on record of poisoning resulting from the eating of decomposing meat, sausages, pork pies, &c. Such poisoning is due to the formation of a ptomaine by the action of germs. If meat is kept in dark, damp, and unventilated places, especially if sewer gas can gain access to the place, there is a greater likelihood of poisonous properties developing.

Meat should be free from the presence of tubercle germs owing to the likelihood of tuberculosis developing in man as the result of eating such meat. Tapeworms and other parasitic worms are conveyed to man through the consumption of flesh which contains the encysted stage of these parasites. This is more likely to take place if the meat is underdone.

In order to deal effectively with the problem of supply of meat there should be in every town a public slaughter-house built on the most hygienic principles, where every butcher should be compelled to kill his cattle. All such cattle should, previous to slaughter, be examined and passed by an inspector, and the meat should likewise be certified as fit for food before being sold to the consumer.

In this country slaughter-houses are chiefly private concerns, and in large numbers of cases the conditions and surroundings are anything but satisfactory. The slaughter-house should be a roomy, well-lighted and well-ventilated building, and should have a floor paved with a smooth, impervious material. This should slope towards a well-trapped drain to remove all washings. The walls should, at any rate in the lower six feet, be lined with a similar material, preferably white tiles. There should be an adequate supply of water to ensure efficient cleansing. All offal should be removed immediately from the building, and as soon as possible from the premises. The walls and floors should be washed down at once after use.

Refrigerated and frozen meat imported from foreign countries and colonies should be passed by an inspector before being allowed on sale.

Fish.—All fish intended for human consumption should be fresh, or have been fresh previous to curing. Such is firm and stiff and free from offensive smell. In unsound fish the eyes are dull, the tail drooped, the scales dull, and there may be discoloration or smell, while the flesh gives on pressure. Even the slightest signs of these make the fish quite unfit for food. If consumed it is likely to result in gastro-intestinal upset.

Shellfish.—The chief source of trouble from these comes through their contamination with sewage, and the possible transference of specific disease through eating them. Enteric fever has been traced to the consumption of oysters and other shellfish which have been taken from polluted waters. Such shellfish should always be placed in pure sea water for some time before consumption. This enables them to clear themselves of infective germs.

Some shellfish, especially mussels, contain poisons which may prove fatal. Others, though quite pure, are apt to cause irritation to certain constitutions.

Further legislation is required to enable local authorities to inspect and control oyster layings or shellfish beds, and to prevent the sale in their districts of such molluscs from sewage-contaminated sources.

Fruit and Vegetables.—Needless to say, all such should be fresh and free from any sign of decay. Watercress has been the cause of some outbreaks of enteric fever owing to having grown in water which had become polluted with sewage.

Milk.—This commodity, which forms the principal item in children's food, is the cause of so much disease that we propose to dilate as fully as possible in the limits of this article, on the question of its supply. Probably no food has been more adulterated or tampered with, *e.g.* cream is abstracted, water added, emulsions of other fats mixed with skimmed milk, and chemical preservatives introduced, &c.

It is essential to health in infancy that the whole milk be given, as skimmed or separated milk containing little or no fat is often the cause of rickets.

But the chief danger from milk comes from the presence and effects of germs. Owing to its nature it forms a very good medium for the growth of bacteria, and if kept too long will turn sour from this cause. This is a common cause of digestive troubles in children. Reddish, bluish, and stringy milk are all due to the presence of different microbes, and consumption of such milk produces diarrhœa. Epidemic diarrhœa, which contributes so much to the heavy infantile mortality in the country, is due to the presence of bacilli in milk. The germs which produce tuberculosis are found in milk, and may be derived from the cow itself, as tuberculosis is a bovine disease. This introduction is especially likely to occur if the disease affects the udder. Children are particularly liable to develop tuberculosis by the taking of such milk, and when it is considered that on the average 10 per cent. of samples of milk taken in various towns are infected with this germ, it becomes an imperative matter for some more drastic regulations to be framed with regard to this traffic.

There are on record many instances of epidemic diseases due to milk, *e.g.* sore throat, diphtheria, scarlet fever, and enteric fever. The first three of these may be due to germs which enter the milk from a disease of the cow; other cases are due to contamination through human agency. The bacillus of enteric fever may be carried to milk by washing the vessels with or adulteration with infected water, or from infective dust getting into it, or from the unclean hands of the milker who may have had the disease recently.

Ordinary milk will not keep very long, especially in warm weather, owing to the growth of germs. Bacteria first enter the milk by spreading up from the outside of the udder along the milk ducts. They multiply rapidly in the warmth. Thus when the cow is milked the next time the milk has numerous bacteria to start with. Others enter from the udder and the hands of the milker, others from dust in the byre, others again are introduced during the transit or storage of the milk. All these bacteria multiply rapidly unless the milk is kept cold, and by the time it reaches the consumer the number is prodigious.

In attempting to obtain a milk free from impurities, cleanliness is essential throughout. The following suggestions have been made by the British Medical Association :

1. That all milking be carried on in the open air, the animals and operators standing on a material which is capable of being thoroughly washed, such as a floor of concrete or cement. Such a floor could be easily laid down in any convenient place which could be found. The site chosen should be removed from inhabited parts as far as possible, and should be provided with a plentiful water-supply.

2. That greater care be expended on the personal cleanliness of the cows. Not only should the cow's body and legs be cleansed from all signs of filth, but the udder and teats should be thoroughly washed every time before milking.

3. That the hands of the milker be thoroughly washed before the operation of milking is commenced, and that after once being washed they be not again employed in handling the cow otherwise than in the necessary operation of milking. Any such handling should be succeeded by another washing in fresh water before again commencing to milk.

To this we would add that a clean washable cap and overall should be worn.

The vessel which receives the milk should have been thoroughly washed and scalded out with boiling water or steam.

It is desirable that the first few drops of milk be discarded.

As soon as the cow has been milked the milk should be filtered into another can, and then cooled at once to a temperature of about 40° F. It is important to try and maintain the temperature about this point, as it checks the growth of germs.

From the farm the milk goes to the retailer. In many cases it has to travel long distances by train, which means that often more than twelve hours have elapsed since the milking before it reaches the consumer. Consequently, in order to lessen the likelihood of multiplication of bacteria, the vans should be of a refrigerating type. They should be kept clean, and used for no other traffic.

It is equally essential at the dairy shop that the milk be kept cool, and the rooms in which it is stored should be clean, light, airy, and free from contamination with any impure air or infection. The milk should be despatched in vessels which have been thoroughly cleansed with steam or boiling water.

To avoid so many transferences it would be better to bottle milk at the farm, and then send it packed in cases ready for immediate delivery. This has been found practicable in America and on the Continent.

When milk reaches the consumer it should be kept in a clean, cool, airy place, which is not exposed to the sun or to dust.

To sum up, then, in order to obtain pure milk it is essential that (*a*) the cows be healthy, (*b*) cleanliness be maintained throughout the whole transit from the cow to the consumer, (*c*) effective means of maintaining the milk at a low temperature be adopted, and (*d*) adulteration and addition of preservatives be adequately punished.

Bread.—Not much illness has been traced to faulty flour or bread. But if the flour be decomposed or the bread mouldy, illness is sure to result. Bread adulterated with alum, and the bleaching of flour to make the bread particularly white, should both be forbidden.

The bread should be baked in clean, well-ventilated surroundings. It would be much better if it were distributed to the consumer in separate bags instead of all the loaves being piled into what is often a dirty cart exposed to the dust of the road.

Before leaving the subject of food we would draw attention to the importance of avoiding the use of chemical preservatives as far as possible, especially in the matter of foods which are frequently used. The use of preservatives enables stale or damaged foodstuffs to be offered for sale, because they prevent such defective articles from rapidly becoming manifest as such. Besides, the continuous ingestion of quantities of these chemicals may and often does have a deleterious effect on the health of the consumer. It is especially in children and those suffering from kidney disease that such harmful results may ensue.

The Committee of the Local Government Board which investigated this matter made the following recommendations :

1. That the use of formaldehyde in food and drink be absolutely prohibited, and that salicylic acid be not used in greater proportion than one grain per pint or pound respectively for liquid or solid food, its presence in all cases to be declared.

2. That the use of any preservatives or colouring matter in milk be made an offence under the Sale of Food and Drugs Act.

3. That boric acid preservatives only be allowed in cream, the amount not to exceed 0·25 per cent., and be notified on a label.

4. That boric acid preservatives only be allowed in butter, the amount not to exceed 0·5 per cent.

5. That chemical preservatives be prohibited in all preparations for the use of children and invalids.

6. That the use of copper salts for "greening" be prohibited.

7. That a Court of Reference be established to supervise the use of preservatives and colouring matters in food.

Legislation should make such proposals legal, and should also make it compulsory for all factories, &c. where food is preserved to be inspected, and thus enable an authority to exercise control over the quality of the food, its manner of preparation, the premises where it is prepared, and the places where it is stored and sold.

DISPOSAL OF HOUSE AND TOWN REFUSE

The effective disposal of this accumulation of dry refuse is a most important part of the public health duty of a sanitary authority. Not only are there the ashes, old paper, and organic waste matter from various households, but a large amount of town debris resulting from road sweepings, &c. The house waste is such a mixed medley of decomposable material that it is very necessary to provide a suitable receptacle to contain it, and the most convenient, as well as the best form, is the portable metal dustbin with a close-fitting lid. Most towns arrange to have these collected once a week. But it would be much better if the intervals were not so long owing to the large amount of organic matter present, which readily undergoes putrefaction, especially in the summer months. It is better, where possible, to burn all such stuff as potato peelings, waste meat, &c., but in the summer this is not always possible, owing to the common use of gas stoves nowadays. The ideal system would be a daily collection carried out before 8 A.M. to avoid nuisance to passers-by.

The carts which receive the contents of the dustbins should be provided with covers so that the wind does not blow the dust and smell about.

The methods of disposal of this waste vary, but there are only two which should be countenanced. One is the removal of it to barges, whence it is carried out to sea and deposited there. This is obviously of limited application. Undoubtedly the best means of getting rid of this refuse is to burn it. There are several efficient furnaces on the market which, by producing an extremely high temperature, reduce all the waste products to a mass of hard materials called clinkers, about one-third of the previous bulk. These may be used for road-making or ground down and mixed with lime to form cement. After starting the furnace the waste matters usually contain enough organic matter to maintain the temperature without adding more fuel. The heat may be utilised for generating steam to work engines for other purposes, *e.g.* the pumping of sewage.

The practice of dumping this refuse into hollows is not to be recommended.

SEWAGE DISPOSAL

The efficient removal and disposal of sewage constitutes one of the most difficult problems in hygiene.

Sewage consists not only of liquid and solid excreta, but the waste water from domestic uses, and liquid trade refuse from factories as well as street washings. This last factor is such a variable one that accommodation has to be made based on the greatest rainfall.

Removal of Sewage.—Two chief methods of getting rid of sewage call for comment. One is the conservancy and the other the water carriage system. The former is suitable for country districts where an adequate water-supply cannot be established, and our description later on is intended to apply to such. The latter is undoubtedly the best method for use in towns. Certain factors, however, such as a severe climate, which freezes the water for long spells, render such a system impracticable.

Many populous towns, which adopt the dry or conservancy system, *i.e.* the use of pail closets or privy middens, are singularly noted for a large infantile mortality rate. It has been proved over and over again that other towns, similar in every respect to the former, except that they have a water carriage system, show a much smaller death-rate. Dr. Sergeant, Medical Officer of Health for Lancashire, says: "In privy midden districts of the county the death-rates from diarrhœa and enteric fever are double those of other systems."

The evil effects of such a system seem to be greatest when the population is most densely aggregated.

We propose to enter into further detail concerning these two methods, but, owing to lack of space, will only describe the best type of each. In the so-called conservancy system the liquid house waste has to be dealt with separately from the excreta, so that provision has to be made for both.

The best type of closet is that known as the earth closet. This should be placed outside the house. It should be well constructed to prevent rain entering, and should have a window of at least two square feet capacity, made to open, and, in addition, other means of ventilation. There should be a movable receptacle consisting of a tarred oak tub or galvanised pail, which will prevent absorption or escape of contents. This should stand on a cement foundation at least three inches above the level of the ground outside. A container for dry earth should be placed inside the closet, and a handful of this should be thrown on to the excreta every time after use. The receptacle should be emptied and cleansed once a week, and the contents may be deposited on land or dug into the garden. The dry earth exercises a considerable deodorant action. It is important that no disinfectants be added, for the rationale of this method is the utilisation of the bacteria in the soil, and the use of disinfectants prevents this action. Well-crumbled, dry loam is the best, because it contains plenty of microbes, which have a disintegrating effect on the excreta, and convert it into simpler innocuous compounds. Sandy soil and chalk are less suitable, and clay useless.

Pail closets or privy middens, owing to the offensive nature of their contents, cannot be recommended. The former are the better of the two, because the receptacle is a smaller one, and is emptied more frequently. The latter should never be countenanced.

For removing liquid waste it is necessary to construct a water-tight drain leading to a cesspool. The waste waters should discharge by a pipe outside the house over a trapped gully leading to the drain. The cesspool should be made of brick, lined with cement and backed with clay, and should have an opening near the top for overflow in case the cesspool becomes full before it is emptied. This overflow should preferably be into a subsidiary cesspool. The cesspool should be arched over, and from the top a ventilating pipe should pass to prevent accumulation of foul gases. As the contents are liable to overflow and thus pollute the surrounding soil, a cesspool should be placed at least 50 feet distant from a dwelling, and 100 feet from any well, spring, or stream, at a lower level if possible. The cesspool should be emptied at regular intervals by the sanitary authority. These intervals should be sufficiently frequent to prevent the likelihood of an overflow.

The water-carriage system is undoubtedly the most hygienic method of removal of waste products. By this means they are got rid of at once. There are two varieties, the separate and the combined. In the former waste waters from road washings are carried away by a separate channel.

The water-closet should be placed against an outside wall; if possible it should form a projection from the house, and be cut off from it by a lobby with ventilating windows on either side.

The water-closet should have a window at least two square feet in area, made to open, and in addition should have other means of ventilation.

The pan, made of some impermeable material, should be of the short hopper type, with an ample area of water to avoid soiling the sides. It should be cut off from the soilpipe by an efficient trap with a seal of at least 1½ inches. There should be a flushing tank discharging at least two gallons of water. The water-supply to this should come direct from the main pipe. The soilpipe leading from the pan should be made of lead, and pass through the wall to an iron pipe, which descends on the outside to the drain. This iron pipe should be continued upwards above the level of the top windows, and act as a ventilating shaft for the drain. The soilpipe should be firmly jointed to the drain, which should be made of iron and, if possible, not pass under the house. It should be laid in a straight line, and with a sufficient fall to enable the contents to flow on. Just before the drain enters the sewer it should pass through a manhole for purposes of inspection and cleansing if necessary. Just beyond this there should be another ventilating shaft. This permits of a through current of air along the whole of the drain, and thus prevents the stagnation of any foul gases which might otherwise pass into the house through a defective closet trap. It is important that the joints of the drain be good, to prevent leakage into the surrounding soil with consequent detriment to health.

The house-drain also receives the rain-water and waste water from sinks, baths, &c. These should discharge over a channel leading to a gully, which is disconnected from the drain by means of a trap.

Sewers are constructed of earthenware or iron pipes, and are circular in shape unless very large, when they are usually egg-shaped and built of brick, lined with cement. If iron is used the pipes should be coated with an impervious varnish on the inside to prevent erosion. This applies to drainpipes too.

Sewers must, as far as possible, be laid in straight lines, and have a gradual fall. Junctions should enter the sewer obliquely to avoid deposit of sediment. Where there is a change in the direction of the sewer there should be a manhole for inspection. Sewers should be ventilated by means of long shafts leading up from the sewers to a level above the tops of houses. They should be placed at intervals all along the course of the sewer. By permitting a constant passage of air along the sewer they prevent the collection of objectionable gases. Sewer air in such cases is very little less pure than the outside air. It is when the sewer air becomes stagnant that it is harmful from the development of offensive gases. These may be so dangerous that death may ensue almost immediately if a person is exposed to a concentrated dose.

Disposal of Sewage.—Having discussed the removal of the waste products from the dwelling, the next problem is how and where to dispose of them. The answer to this question must depend very largely on the geological conformation of a district, and the character of its sewage.

Coast towns may be able to discharge their sewage into the sea, but there is often an objectionable return of it with the incoming tide.

Other methods of disposal are the spreading of it on land, where it may be dealt with by the method known as broad irrigation, or that of filtration. The principle underlying both is the same, viz. to enable bacteria in the soil to break down the sewage into simpler compounds, and thus purify it. In the former case the level of the soil should be slightly sloping, the soil should be porous and be drained by subsoil drains five to six feet deep, by which the effluent can be conveyed to the nearest stream. The soil can be utilised for growing coarse grass. The sewage, which should have been previously screened to remove the grosser particles, is passed on at intervals, and gradually sinks through the soil, being purified in its course. About one acre of land is required for the sewage of 300 persons.

Intermittent downward filtration requires a fine porous soil, subsoil underdrained six feet down, and intermittency in application, the flow lasting for six hours, and then the land resting for eighteen hours to enable it to deal properly with the sewage. One acre of land will purify the sewage of 1000 people by this method.

Previous to this disposal on land the sewage may undergo chemical treatment to clear it by precipitation of solids. In such a case one acre will suffice for 2000 persons by the method of downward filtration.

Such a treatment is very suitable for dealing with sewage in rural districts, or in towns where a suitable soil can be obtained. The water-logging of the soil and frost interfere with this method, also the presence of trade refuse of a chemical nature, so that in many cases other methods have to be resorted to. Of these undoubtedly the best is one of the various schemes of dealing with sewage on biological lines. The main features underlying treatment by this method are the utilisation of bacteria present in the sewage for breaking down the complex substances into simpler compounds. The purification is carried out in two stages. After screening off the grosser solids the sewage is passed into a tank, where it remains still for some hours. This gives certain microbes which flourish in the absence of air an opportunity of disintegrating the small solid particles, and breaking up the complex molecules. From the septic tank the sewage is passed on to a filter-bed made of fine coke or clinkers, in the fine interstices of which other bacteria oxidise the simpler organic compounds into innocuous mineral salts. Sewage which has been treated in this way has an effluent which is pure enough to let into a stream or river; but it contains about as many germs as the original sewage, and as some may be pathogenic, if it is discharged into an estuary where shellfish beds lie there is danger of infection spreading. In such cases it would be better for the effluent to be first of all filtered, as in the case of water purification.

DISPOSAL OF THE DEAD

The sanitary disposal of the dead is another problem of importance, especially as many have died of an infectious disease.

The overcrowding of cemeteries in the past has led to injurious effects on the health of those living near. But there is no reason why burial-grounds need be a source of danger to a community. The great object is to obtain as rapid a disintegration of the soft parts as possible by resolution and oxidation. Consequently the soil should be light, porous, and drained to a depth of eight feet. Loam or sandy mould is the best. Clay is unsuitable because of its impervious texture, and gravel because it is too porous.

The bodies should be placed in coffins of wicker, light wood, or papier-maché, which would easily decay. They should be buried about one foot deep, as it has been found that in such cases the perishable parts disappear inoffensively within one year. Deeper burial prolongs the time of complete disintegration of the soft parts, roughly to the extent of one year for each foot deep.

Cemeteries should be situated beyond the limits of present or probable future dense building areas. They should not be placed on elevated ground, whence water may find its way to dwellings or water-supplies at a lower level.

The more general adoption of cremation would solve some of the problems connected with the subject, as a body of average weight is reduced to about 3 lbs. of inorganic ash in two hours. This is undoubtedly a more hygienic method, and diminishes the amount of burial-ground required.

TOWN-PLANNING AND HOUSING, ETC.

Equally important with the purity of the water and food-supply is the provision of a pure supply of air.

At the outset we must consider the importance of a healthy site for a town or village. Such a site is one where the ground water is low and does not fluctuate much. Rocks, permeable chalk, and gravel are all examples of healthy sites. If the soil is moist, such as a clay bed, or is alluvial, the surrounding air becomes relatively impure, and is bound to affect the general health of the community.

The town should be laid out so that there is a sufficiency of light and ventilation. To ensure this there should be an open space in front of and behind houses at least equal in length to the height of the buildings, so it follows that the width of the streets should be at least equal to the height of the houses in them. All streets should be open, *i.e.* cul-de-sacs and closed-in courts should be prohibited.

Large open spaces such as parks and recreation grounds, by providing adequate breathing-space, add largely to the amenities of a district from the hygienic point of view.

The presence of trees in the streets adds to the health of a district, but they should not be large enough to interfere with lighting or ventilation.

Density of population has a direct influence on the mortality of the inhabitants, and this becomes especially marked where the crowding occurs in ill-ventilated centres. Thus people who inhabit back-to-back houses, where there is a deficiency of light and ventilation, and where the sanitary arrangements are imperfect, exhibit a much greater mortality from all causes, especially consumption and the chief infective diseases—*e.g.* in Salford it has been shown that the death-rate in the district where there were no back-to-back houses was 26·1 per 1000, while in that where 50 per cent. of the houses were of this character it was 37·3 per 1000.

Slums breed disease, owing to the general filthiness of the premises, partly due to the carelessness and indifference of the people inhabiting them, partly because the houses are often unfit for human habitation, and partly because of the gross overcrowding which occurs. The lack of sufficient and proper food, along with much intemperance, tend to create a lack of resistive power to disease.

Adequate scavenging arrangements for ensuring clean streets, means for allaying the dust which is becoming such a problem in these days of quick transit, and more control over nuisances arising from smoke and offensive trades, &c., are all necessary to maintain the air in a state of comparative purity.

Slaughter-houses and lairs for cattle should not be situated within 100 feet of any dwelling-house.

The keeping of cows and horses, &c. may easily give rise to a nuisance. It is most important that all cowsheds be properly ventilated, frequently cleansed, and no accumulation of manure permitted. This applies equally to stables. Compulsory daily removal of manure should be insisted on, owing more particularly to the readiness with which flies increase through such collections.

Pigs should not be kept in towns, and styes should always be situated at a considerable distance from a dwelling. The stye should be built with an impervious floor, and means should be taken to adequately cleanse it at frequent intervals.

The keeping of poultry should not be permitted in towns, unless there is ample garden space in which they can run.

Offensive trades, alkali and other chemical works, owing to the offensive nature of the effluvia or the irritating character of the gases, are likely to prove injurious to the general public, and so should be situated away from the neighbourhood of dwelling-houses.

The obnoxious emanations from the various offensive trades must, apart from the nuisance which they create, prejudicially affect the health of the people by the feeling of nausea and gastro-intestinal upset which they are liable to give rise to.

The offensive trades, according to the Public Health Act, 1875, are blood-boiler, bone-boiler, fell-monger, soap-boiler, tallow-melter, tripe-boiler, and any other noxious or offensive trade, business, or manufacture. The Local Government Board has issued model by-laws in regard to these trades, and also those of leather-dresser, tanner, fat-melter or extractor, glue-maker, size-maker, blood-drier, and gut-scraper.

The same general provisions appear in all, with additions and variations according to the particular trade in question. The following summary will show their general character:

(1) All materials not required for immediate use or treatment shall be so stored as to prevent effluvium. (2) The best practicable means must be adopted for rendering any offensive vapours emitted during melting, boiling, &c. innocuous, *e.g.* passing the vapour through a fire into a tall chimney. (3) The drainage must be kept in efficient order. (4) Floors must be kept in good order, so as to prevent the absorption of filth. Usually the floors should be either swept, washed, or scraped at the close of every working day. All refuse so collected should be removed at once in covered receptacles. (5) Walls must be kept in good order to prevent absorption of filth, and should be lime-washed twice a year. (6) All apparatus, including implements and vessels, must be kept clean; where possible they should be cleaned daily.

With regard to chemical works the best practicable means should be taken for preventing the escape of noxious and offensive gases, and of rendering them harmless and inoffensive.

There should be sufficient provision of public water-closets and urinals, and we would emphasize the importance of constructing suitable urinal accommodation for women without any payment being exacted.

Every town or village should have adequate means of protection in case of an outbreak of fire. Factories and workshops should have the stairs made of some substance resistent to fire, and the separate floors should be shut off from each other by asbestos matting. All such places, in addition, should have other means of escape, especially if the buildings are high.

There should be facilities for baths, but in the case of public swimming-baths more stringent regulations should be made. No one should be allowed to enter the swimming-bath without previously washing all over, and it should be made illegal for a person to walk along the edge of the bath with outdoor boots on. Bath water is easily polluted in these ways, and it is detrimental to health to bathe in dirty water.

It is of importance that all buildings, such as churches, halls, and entertainment places, where masses of people gather together, should have adequate and free ventilation and be properly warmed. This is because there is a finer degree of impurity, which is impalpable, but which is as effective in deteriorating the general health of a community, as the grosser contamination which we have already considered. Such consists in the invisible organic impurities which permeate air in the presence of crowds of people, and is produced by the exhalations from their bodies. This effect becomes progressively marked where this crowding is permanent, and more especially so where the natural means for removing the impurities are lacking or deficient.

A prejudicial effect is likely to be exhibited on those who inhabit dwellings erected on recently-made ground—*i.e.* old hollows filled up with town refuse, and so such levelling up should not be countenanced for building purposes.

Granted a healthy site, it is important that the buildings constructed on it should be such that there is no chance of damp penetrating. Thus the foundations must be made of a thick bed of concrete, the walls have a damp course above the level of the soil, and the roof be watertight.

Houses should be built so that, as far as possible, each room will obtain some sunlight, and so single houses should be constructed with their four corners to the points of the compass, while those in rows should be erected with the rows running north and south, so that the rooms face east and west.

There should be adequate window space equal to one-tenth of the floor area of the room. The windows should open top and bottom, and be carried up as near the ceiling as possible. The height of the rooms should not be less than 10 feet nor more than 13 feet. Each room should contain a fireplace and chimney. Basement rooms should never be used for sleeping purposes. There should always be a window opening on to the staircase, so that when it is open there is an opportunity for free circulation of air upwards. It is most important that all the windows or openings should not be on the front or one side only of a house. In such cases there is no opportunity of a through current of air, and stagnation of impure air ensues, with bad results to the health of the inhabitants. This form of house is exemplified in the back-to-back premises which are still too common in the industrial centres of this country. The same importance of through ventilation is necessary in the case of flats, and more so owing to the want of circulation produced by the absence of a staircase in the dwelling.

It is important that all houses unfit for human habitation should be condemned, and either rendered habitable or pulled down. Under the Housing and Town-planning Act local authorities must inspect all premises, and, if necessary, make an order prohibiting the habitation of any that are unfit. Where private enterprise is lacking the Local Authority should build suitable houses.

Common lodging-houses and houses let in lodgings to people of the working class are under supervision, and must conform to certain regulations and by-laws framed with the idea of preventing overcrowding and other nuisance arising.

INFECTIVE DISEASES

This term is used to describe those diseases in which the body is invaded by some germ or poison. This multiplies in the system, and by its growth produces the symptoms and signs which we recognise as disease. The specific germ of all infectious diseases has not yet been isolated, but it is pretty certain that all these conditions are due to the growth of some living organism. In many cases the infection is given off again from the body, and this makes the disease transferable to other people. Probably most of the infectious fevers transmit the infection by the breath. Some spread the disease through the secretions, *e.g.* mucus from the nose and throat in the case of diphtheria and scarlet fever, sputum in tuberculosis. Others convey infection by means of the excretions, *e.g.* vomit in cholera, urine in enteric fever, and bowel discharges in both these diseases. Infection may also be given off from the skin in smallpox, &c. Germs given off thus do not die at once, but may live for a long time, in some cases for years. They may enter another person and so reproduce the disease. This entry may be effected either directly through the air from person to person, *e.g.* by breathing the air expired by an infected case; or the infection may lodge on clothing, the floor, walls, &c., and later may be stirred up into the atmosphere, and then inhaled or swallowed; or again the hands may become soiled and thus convey infection to the mouth. Other means of access are through the medium of infected water, milk, &c. Some infectious diseases are transmitted through the agency of insect life. Flies, through their habits of feeding on garbage and food indiscriminately, are probably responsible for much infection. Other insects, through their blood-sucking propensities, convey the parasite directly into the system, *e.g.* mosquitoes in the case of malaria and yellow fever, the rat flea in that of plague, the bed bug in leprosy. There is every likelihood that human fleas and other vermin are responsible for the spread of some infectious diseases. Before leaving this part of the subject we would draw attention to the conveyance of infection through the agency of "carriers." Carriers are people who may or may not have had a particular disease, but harbour the infective virus in their bodies, and are capable of giving the disease to others just as if they were suffering from the disease. It is particularly in the case of diphtheria and enteric fever that we know of the existence of such sources of infection. It is quite likely that the spread of other diseases also may be traceable to "carriers."

The rôle which animals play in the causation of infective disease must not be overlooked, for tuberculosis is spread through infected meat and milk, scarlet fever and diphtheria from certain diseases of the cow; diphtheria also from a similar disease in cats.

There are various factors at work determining whether disease will arise supposing that infection has been conveyed to the body. These may depend either on the infective material, *e.g.* the number of germs introduced or their virulence; or, on the other hand, the susceptibility or otherwise of the body tissues. Susceptibility may be due to an inherent lack of power in the body cells of combating the intrusion. Such a state may be inherited. On the other hand, it may be produced by various conditions, such as insufficient or unsuitable food, fatigue, or exposure to heat, cold, dampness, or offensive effluvia, &c.

There is, too, a certain racial predisposition to some diseases. Age also in many instances has a modifying influence on susceptibility to infection, and sex to a less extent. Climate and season exert a decided influence in determining the onset of an epidemic.

Immunity against a disease is a state of the body which prevents the introduced microbe from developing. It may be natural or acquired. Acquired immunity is gained either naturally, through a person having had the disease and so becoming insusceptible to a second dose of infection; or artificially by the infection of small doses usually of a weakened form of the specific germ. This method is known as vaccination, and is used as a preventive in enteric fever, plague, cholera, and smallpox. Immunity is also obtained by the introduction of blood serum from an animal which has been immunised by repeated injections of the disease germ. This is the principle underlying the antitoxin treatment of disease, and is used as a preventive in diphtheria and tetanus.

Natural immunity is an inherent power in the body tissues of overcoming the infection, without having previously passed through the disease.

Usually one attack of an infectious disease prevents the onset of a second attack, at any rate until after the lapse of a number of years. But this does not always follow. Some microbic diseases predispose to a subsequent attack, *e.g.* influenza and rheumatic fever.

Infectious diseases are said to be epidemic when they spread themselves over a larger or smaller area. When this area extends over a large surface of the globe the outbreak is termed a pandemic. When certain diseases are associated permanently with certain localities they are said to be endemic.

After the infective virus has entered the body there is a period during which the germ is multiplying and producing its poisonous exhalations before these show their effect in the onset of signs and symptoms of the disease. This period is known as the incubation period, and varies for different infections. If a person exposed to an infectious disease does not develop it within the longest known incubation period after the last contact, it means that he has escaped the infection. This is termed the period of quarantine.

Having given a brief outline of infective disease, the factors which tend to its onset and dissemination, and those which may modify it, we come next to discuss generally the main lines of preventive measures which should be adopted to prevent or control the disease when it occurs. We can only give a broad outline; each disease in itself may require special details which we cannot enter into here.

All infectious diseases are not amenable to the preventive measures which are available at present. But a good many, to a large extent, may be kept in control: especially is this the case with those diseases of which the avenues of dissemination are known. To a great extent we can exercise control where the disease is directly transmissible from person to person, but certain diseases of this type, such as measles and whooping-cough, owing to their infectivity for several days before the disease is recognised, make it difficult to check the spread. The presence also of mild types, which are almost unrecognisable, in scarlet fever and diphtheria, and in addition in the latter case the infectivity of "healthy" "carriers," assist in lessening the certainty of keeping the outbreak in check.

Where the spread is by means of water or food-supply, or where insanitary conditions exist which tend to the production of disease or influence its virulence, we may hope to limit the epidemic.

In the first place we would say that all infective diseases should be notified to the local health authority. This will give early information as to the whereabouts of the cases. At present the notifiable diseases are: smallpox, cholera, diphtheria, membraneous croup, erysipelas, scarlet fever, typhus fever, enteric fever, relapsing fever, continued fever, puerperal fever, and tuberculosis. It will enable the medical officer of health to offer and in some cases compel isolation in a hospital; also to offer disinfection, and in certain cases investigate the sanitary conditions of the premises. It also gives means of detecting any grouping of cases in connection with a school, dairy, or water-supply, &c.

Following on notification comes inquiry to try and ascertain the source of the infection.

Once the disease is recognised the person should be isolated from others. This should be carried out, either in a hospital or at home, so that no one has access to the patient except those in charge. This implies control over all utensils, clothing, and excreta, &c., so that there is no risk of spread of infection. Disinfection of all clothing, premises, &c., with which the patient has been in contact should then take place, and likewise supervision over all those who have been in contact with the infected person, until the period of quarantine is over. This should be particularly strict, where one of the more serious forms of infectious disease is in consideration, in the case of those whose occupation has to do with the making, preparing, or distributing of food, or the making or washing of clothes. In many cases they should temporarily be prohibited from carrying on their occupations.

Adequate control over the water-supply will tend to lessen risk of water-borne epidemics. Greater supervision over the milk-supply will prevent or minimise the risks of outbreaks of tuberculosis, scarlet fever, and diphtheria.

Each individual should assist in trying to check an epidemic by not mixing in a crowd when tired or hungry, and by avoiding public meetings.

HOSPITALS

The provision of special buildings for nursing the sick constitutes one of the forms of control over the general health of a community, more particularly in the case of infectious diseases hospitals.

These buildings may be general hospitals for the reception of medical and surgical diseases, or special hospitals either for infectious or non-infectious diseases. We are chiefly concerned here with isolation hospitals, for it is particularly with infectious diseases that the Public Health Department of a place is concerned.

The choice of a healthy site is even more important in the case of a hospital which houses sick people than in that of a dwelling-house. For a general hospital this should be within easy access of the population. For an isolation hospital it is better to be removed from the neighbourhood of a town: especially is this necessary in the case of a smallpox hospital. The Local Government Board have suggested that a smallpox hospital should not be erected (1) within a quarter of a mile of a hospital of any kind, or a workhouse, or similar establishment, or a population of 150 to 200 persons; (2) within half of a mile of a population of 500 to 600 persons, whether in one or more institutions or dwelling-houses.

The provision of a free supply of pure air is the most important point to be attained in building a hospital. Consequently, as far as possible, the buildings should be constructed in special grounds with plenty of air space surrounding them. This is especially the case in an isolation hospital. Such a place should be surrounded by a wall 6½ feet high. It should consist of separate buildings, such as (*a*) an administrative block containing rooms for the staff, kitchens, &c.; (*b*) one or more ward blocks for the reception of patients, each separate disease having a separate block; and (*c*) various outhouses, such as laundry, mortuary, and disinfecting room. Each of these different groups and various blocks for patients should be separated from each other and the boundary wall by 40 feet.

The aggregation of large numbers of sick persons together in one building constitutes the most important factor in hospital hygiene, for if there is overcrowding it is a well-known fact that disease takes on a more virulent form. Hence the necessity of adequate room for each person. Where such a factor has to be contended with in a general hospital it must be obvious that in an infectious diseases hospital the need for plenty of air space is more marked still. Each patient should have not less than 2000 cubic feet of air space, 144 square feet of floor space, and there should be 12 linear feet of wall space to each bed to ensure that there is no overcrowding.

In addition to open windows there should be other means of ventilation by valves or tubes.

The wards should be well lighted by windows reaching up to within a few inches of the ceiling, which should not be more than 13 feet from the floor. There should be a window between each bed, and the window area should be such that there is 1 square foot to every 80 cubic feet of space in the ward.

The wards should be adequately warmed by hot pipes round the sides and fires in the centre.

The floors should be made of impervious material, and the walls be either tiled or smooth and covered with a washable paint. All corners should be rounded off to facilitate cleansing and prevent accumulation of dust.

Water-closets should be separated from the wards by means of a short lobby with windows opening on either side to provide cross ventilation, and thus effectively disconnect them from the wards.

All bedding, clothing, and domestic utensils should be differently and distinctly marked for each separate disease. They should be stored in the block. All clothing should be thoroughly disinfected before being sent to the laundry.

Precautions are necessary to prevent, as far as possible, infection from spreading to people outside, and so visitors should not be allowed except in case of serious illness. Every patient, before being discharged, should pass through a series of three rooms, in the inner of which he should undress and leave his infected clothing, in the middle should have a disinfectant bath, and in the outer should clothe himself in clean garments and emerge directly into the open air. It is advisable that all employed in the wards should have a bath as well as changing their clothes before mixing with people outside.

The question of how much accommodation to provide is difficult to decide, owing to the fluctuating nature of epidemics. The usual plan is to allow one bed per 1000 people. In times of sudden and severe epidemic, however, this often proves inadequate, and then temporary accommodation has to be set up. This does not always prove satisfactory. The best method would be to build the administration block larger than is necessary to house the full staff, so that extra accommodation is available in an emergency.

Sufficient acreage should be provided to make allowance for such need, and foundations should be laid on which temporary buildings could be erected as required.

Adjacent villages and small towns should combine if possible to maintain an isolation hospital.

DISINFECTION

This means the destruction of the germs which produce infective and contagious diseases. There are two chief ways of carrying this out, either by the employment of heat or the use of some chemical, and each has its advantages.

The simplest way of using heat is to burn all objects which are of little value. Another method is the boiling for five minutes of articles which will not be spoilt thus. Heat is employed on a large scale in disinfecting articles of clothing, &c. by means of hot air or steam. The former method is not so reliable owing to the slowness with which the heat penetrates any folds. A temperature not higher than 255° F. has to be used to avoid damaging any fabrics by scorching. This requires to be maintained for four to six hours. Such treatment is the only means of disinfecting leather goods and books, for steam destroys this class of article. Steam is much more effective as a disinfectant, and acts very quickly, about twenty minutes being long enough to ensure thorough treatment. There are many varieties of apparatus for disinfection by such means, but the most efficacious is one whereby saturated steam under pressure is passed into a chamber in which the articles are laid in trays or hung on pegs. This chamber is situated between two rooms, passing through the wall between them and projecting into each. One room receives all the infected articles, which are then placed in the chamber. After treatment they are removed from the other side into the disinfected room, whence they are distributed. Such is the method of disinfecting bedding, mattresses, and all fabrics which will not be spoilt by the moist heat.

Some such installation should be erected by every large sanitary authority, and smaller ones might combine to own one. All disinfection should be carried out free of charge.

Chemical disinfectants may be liquid, solid, or gaseous, but the two last attain their greatest efficiency when employed dissolved in some liquid medium. They are used in disinfecting excreta and goods, &c., which cannot be exposed to heat. Sputum, urine, and discharges from the bowel should pass into a vessel containing some chemical disinfectant such as carbolic acid 1 in 10, cyllin 1 in 50, &c. More of the solution should be added afterwards until the quantity of disinfectant is equal to that of the discharge. The two should be well mixed, and after standing for half an hour should be burnt, buried, or poured down the closet.

All secretions from the nose and mouth should be removed by pieces of clean linen or paper handkerchiefs and burnt.

The efficient disinfection of a room should be carried out in two stages. After all fabrics have been removed and sent to the disinfecting station, the crevices should be plastered up and the room fumigated for six hours with formalin vapour. This acts best when the air is moist and has a temperature about 70° F. After this free ventilation is necessary to remove the irritating vapour. The room should be cleared of all furniture, and all the paint and woodwork thoroughly scrubbed with soft soap and hot water. The woodwork of furniture should be well washed, and the upholstered parts thoroughly beaten and brushed, and exposed to sunlight in the open air. All wall papers should be stripped off, and the ceiling preferably scraped. These should be washed over with a chloride of lime solution before repapering.

INDUSTRIAL HYGIENE AND OCCUPATION DISEASES

This subject falls into two parts: (*a*) as it affects the general public, (*b*) as it affects the employees themselves.

We have already considered the injurious effects of offensive trades and chemical works on the health of the community, and the methods to be adopted to obviate this as far as possible.

Now we have to look at the subject from the point of view of the individuals engaged in the various industries. There is great evidence of the dangerous effect of many trades on the employees, and it is therefore necessary to use every possible means to lessen the risk of disease.

This may arise by working in badly-ventilated or overheated factories, which cause the workers to catch cold easily, and thus lead to an excess of bronchitis and rheumatism. Besides, they give rise to fatigue, which engenders carelessness, and so accidents are more likely to ensue.

Other sources of disease are the inhalation of dust, in which case the particles may irritate the nasal passages and lungs by their physical properties, and lead eventually to disease of these organs, *e.g.* fine particles of steel in cutlers, stone dust in stone masons. Other dust may be dangerous because of infective material incorporated with it *e.g.* the dust produced in wool-sorting may cause anthrax, that in sorting rags may lead to smallpox, &c. Again, other forms of dust are directly poisonous, and of such lead and mercury furnish examples.

In certain manufacturing processes gases or vapours may be inhaled. These may be directly irritating, *e.g.* chlorine and acid fumes; or definitely poisonous, *e.g.* carbon monoxide and carbon disulphide.

Not only may poisonous dust or vapours be inhaled, but they may be absorbed through the skin or swallowed.

Some forms of dust or vapour are dangerous owing to the risk of spontaneous ignition or explosion occurring when mixed with air. Such are found in linoleum works from finely-powdered cork, also in coal mines from coal dust or marsh gas.

Speaking generally, the conditions in factories which lead to the onset of these diseases are imperfect ventilation, absence of efficient means of withdrawal of dust, lack of adequate supervision of workers, and inadequacy of washing appliances.

The means of control which suggest themselves, then, are roomy buildings in which there must not be overcrowding. According to the Factory and Workshop Act there must be at least 250 cubic feet per person, more than this in certain dangerous trades, or if working overtime in the case of women. Adequate means of ventilation also are required to enable the air to be kept up to a reasonable standard of freshness. In certain trades which generate much dust, vapours, or gases, additional means of ventilation should be provided to remove them before they enter the general air of the room; thus there should be exhaust ventilators near the point of origin of the dust. In some trades the adoption of wet processes lessens the amount of dust produced, but in spite of these precautions it is sometimes necessary for the workers to wear respirators.

Among other factors bearing on the health of the employees is the temperature of the workrooms. A reasonable temperature should be secured without interfering with the purity of the air. Regulation of the humidity is also important, as when this is high, associated with a raised temperature, as is the case in some cotton factories, a much greater feeling of oppression is produced.

Cleanliness likewise is important, not only the regular cleansing of floors, but the periodical lime-washing of walls, &c.

Adequate sanitary accommodation should be provided.

In certain factories, more particularly those which deal with metallic poisons such as lead and mercury, &c., there should be every facility for washing, and the provision of baths would be a great help. These should be taken regularly.

In such places, too, there should be rooms for the workers to change their clothes, and in certain cases these should be heated to dry the damp working clothes. In some trades close-fitting overalls should be worn, and they should be frequently washed.

Food should never be eaten in the workrooms, but special accommodation should be provided. No one should start work without having taken food.

Where possible the use of mechanical appliances should be adopted in some of the more dangerous processes, *e.g.* the manufacture of lead.

Regular inspection of factories and medical examination of workers are advisable.

Other forms of disease associated with occupations are those due to the overtaxing of one or other of the body tissues.

Long-sustained adoption of abnormal postures gives rise to disease, and this is seen, *e.g.*, in the chronic inflammatory conditions of the hand and knee which are found in miners, also in housemaid's knee, and in the varicose veins or flat feet which so frequently are found among shop assistants and others who have to stand for long spells at a time.

The continuous over-use of certain muscles, more particularly those associated with the more delicate movements, gives rise to spasm or cramp, and this is exhibited in writer's palsy and telegraphist's cramp.

Other diseases are due to overstrain of the nervous system, owing to tension carried on for too long a time; *e.g.* engine-drivers and signalmen with their long hours of continual alertness are particularly liable to this, of which the lamentable series of railway accidents which have occurred so recently furnish such striking examples.

CONCLUSION

The vigour of the race is the most important asset to a nation, and this depends in large measure on the cultivation of hygienic ideals.

To attain this end one of the most desirable steps is to create a special Health Department in the State. This should deal exclusively with all subjects which affect the health of the community. At present such functions are carried out in part by the Home Office, Local Government Board, and other Government departments.

Each town should have its medical officer of health devoting his whole time to the work. Smaller towns and communities should be combined to have a similar official, who should be a State servant. Under the medical officer of health there should be minor officials dealing with inspection of premises, &c.

The State Department should have power to compel lax authorities to carry out their obligations.

H. Maughan Brown, M.D.

MENTAL INFLUENCE ON HEALTH

OUTSIDE the region of mental disease, or even definitely morbid mental states which have a distinct correlative effect on bodily health, it needs little exposition to make clear that the bodily health is in a very real sense and to a marked degree at the mercy of the mind. A hundred "patent" medicines ply a thriving trade through this state of things; for it has been shown that in many cases the drugs such medicines contain can have no effect upon the diseased conditions which in fact they cure. The medicines are advertised widely with seductive accounts of the benefits they confer, and the mind becomes convinced by the specious reports to such an extent that, either by the pronounced stimulation of the recuperative forces of Nature, or because the disease, being merely of function and not organic, is open to cure by suggestion, the body recovers its health.

It is also a sufficiently obvious fact that a well-known and trusted tonic, if administered in the dispensary as an ordinary medicine, will often fail to produce the effect which a dose poured from the bottle bearing the well-known label ever causes. Or, again, a person may be convinced that a certain drug invariably produces disagreeable effects which are, in fact, not complained of if the drug is administered under another name. It is a fact of universal experience that an additional buoyancy and vigour are felt on the day that a number of friends spontaneously remark upon one's healthy appearance.

On the other hand, it is upon record that a man, upon the abnormality of whose lungs two insurance doctors remarked, at once lost appetite and took to his bed completely prostrated. He had been told that one shoulder was lower than the other. Almost at once a distinct and unmistakable pain was felt in the shoulder, breathing became laboured, and a certain amount of sputum was produced. But when, on submitting himself to a famous specialist for examination, he was told that his lungs were quite sound, he at once felt a recovery of vigour, all the symptoms subsided, and at length disappeared, and he was able to go about his daily work again. Worry at times may cause such various effects as diarrhœa, incontinence of urine, indigestion, vomiting, nervous exhaustion, and complete breakdown.

It is clear, then, that the normal physiological functions, though normally and apparently always carried on automatically and unconsciously, are in some way under the jurisdiction of the mind. Of course it is easy to satisfy oneself of this by the crude experiment of holding one's breath. In this way a physiological process can be prevented by the action of the conscious mind. It is not so widely realised that another department of the mind—the unconscious or subconscious mind—can and does exercise a more immediate and more powerful control of bodily processes. It is the subconscious mind to which such *suggestions* as those of apparent good health or diseased lungs—referred to above—appeal, and it is by its action that in the one case a feeling of vigour and in the other a pronounced feeling of exhaustion and ill-health are experienced.

The unconscious mind is the storehouse of memories which emerge into the conscious mind under certain stimuli. It has a very powerful control of the nervous system and blood-vessels, and has a superior mental and moral activity. It has charge of habits and habitual actions; but in spite of its enormous power it can be ruled by the conscious mind. It is this fact which is of so much importance in shaping health. The evils which spring from the worrying habit of mind have been pointed out. But it is now clear that this can be changed. The conscious mind can so determinately fix its intention on hopeful thoughts that in time this new temperament will fall into the subconscious mind, colouring the outlook insensibly and automatically improving the health.

Discipline of the mind is needed, and there is this much admitted truth in Christian Science that the conscious dwelling upon thoughts of overflowing health and the perfect functioning of the body will inevitably raise the plane of health. Conversely, the dwelling upon thoughts of disease cannot but emphasize the disease. If the disease is functional this is marked, and even in the case of organic disease (which with a fair chance Nature will cure) the healing power of Nature is much debilitated, and a cure either retarded or perhaps even prevented.

It must be remembered that a body in perfect health can undergo risks and pass through spheres of infection with impunity, but a body which is in poor health is apt to succumb to the first invasion of disease germs. Hardly anything lowers the body's power of resistance so much as fears, worries, or depressing thoughts. Persistent hard work need have no ill effects if the mind is kept free from worries. This calls at times for rigorous self-discipline, and in no sphere is effort so little thrown away.

But such depressing thoughts may cease to be merely temporary and become almost obsessions or habits of mind, and with these must be reckoned such habits as those of self-abuse, the drug or tobacco habit, which may have a direct and pernicious effect upon health. The control of such habits is still a question of mental action. Ordinary medical treatment has been suggested for some of these habits; but it is difficult to see what drug can be prescribed for a habitual dread of disease, or the drink habit.

A method of attacking such habits is offered by auto-suggestion. The idea of all "suggestion" as a curative agent is to reach the plane of the mind which controls the automatic or habitual acts—*i.e.* the subconscious mind—and in the case under consideration the normal willing and reasoning powers have turned traitor. The power of will seems almost to be utterly lost, and the reason or the imagination seems to be fixed in such a state that whatever appeal is made to it seems only to touch it either temporarily, or to such a depth that it is completely unreliable. Suggestion aims at getting behind these conscious powers, and hence some state must be produced which approximates to sleep of the normal waking faculties. Indeed, suggestion can be carried out by a second person on one who is normally sleeping. Especially is this the case with children, the suggestions if whispered into the ear rarely waking the child. With adults the difficulty is not to wake the patient.

Auto-suggestion is the deliberate production by oneself of a sleepy and comfortable state and then repeating slowly the suggestions required. One may take an easy-chair near a warm fire in the half-light, and then in the drowsy comfort make the suggestions: "I shall not feel such-and-such symptoms." "Such-and-such a desire is hateful to me, and will occur to me no more." "I shall not find pleasure in such-and-such a drink again; the taste is abominable to me and I can never desire it again."

Of course there is nothing magical in auto-suggestion. A lifelong habit will not be cured or appreciably affected by five minutes auto-suggestion. The ease with which any habit can be cured is naturally proportionate to its intensity and the length of time in which it has been ruling. But there is a very wide range in which auto-suggestion can be of the utmost value. Hate, fear, nervousness, self-consciousness, diffidence, outbursts of anger, self-abuse, drink and drug habits, constipation, are only a few of the states and diseased conditions which can be cured if the suggestion is practised regularly. It is strange to feel a habit which once held us in thraldom gradually losing its hold, and yet this can be quite definitely achieved with a little patience and persistence.

At times, however, there are mental influences which disturb health to such a degree that some more powerful method of attack is needed. In these cases, no doubt, auto-suggestion would effect either a cure or an amelioration of the condition in time, but before that the body may be so debilitated or functionally disturbed that the means is practically useless. In such cases hypnotism offers the best chance of success.

H. SIDEBOTHAM.

HYPNOTISM AND TREATMENT BY SUGGESTION

When I began to employ "suggestion" in medical practice twenty-four years ago, I believed that it was necessary to produce first a condition of artificial sleep. That view, the result of the earlier writings of James Braid, was then shared by other workers in the same field.

Later, I found that "suggestion" could be employed equally successfully without the induction of any state even superficially resembling sleep.

On my second visit to various continental countries where suggestion was largely employed, I found that most operators had abandoned their earlier views and arrived at conclusions similar to mine. The modern theory is that every one possesses a secondary consciousness, called by Frederic Myers "the sublimal consciousness," by William James "the hidden self," and that suggestion calls its powers into action—powers much greater than those of the ordinary consciousness.

Braid himself in his later writings, which apparently attracted little attention, abandoned his earlier theories. As he found that only one in ten of those he cured by suggestion passed into a state which in any way resembled sleep, he proposed to abolish the entire terminology which he had invented. The use of such words as hypnotism, hypnosis, hypnotic, and the like were, he said, misleading, and tended to make patients believe that they could not be cured unless they were put to sleep, whereas, in truth, the contrary was the case.

He demonstrated the existence of a secondary consciousness, and believed that suggestion acted by arousing its powers; thus forestalling the theories of Frederic Myers and William James.

As Braid truly said, "suggestion" is not a universal remedy, it is simply an additional weapon by means of which medical men can combat disease. It is sometimes useful in organic maladies, especially as a substitute for narcotics in the relief of pain. Its most brilliant results, however, are obtained in purely functional nervous disorders, a class of disease in which drugs are often of little or no avail.

Treatment by suggestion has been employed with good results in the following and other diseases: hysteria, neurasthenia, dipsomania, drug habits, moral insanity chorea, stammering, sea-sickness, obsessions, psychical impotence, &c. &c. Considerations of space prevent me from referring in detail to any except the two last.

Obsessions are of frequent occurrence, and often the patients are otherwise in good health; in many instances they suffer from a single symptom, such as a dread of enclosed places. I could quote numerous cases where the obsession interfered with occupation or entirely prevented it; often the patient's livelihood has entirely depended on whether he could or could not be cured of his obsession.

In cases where, apart from the obsession, the patients are in good bodily and mental health, it is as absurd to suppose that a drug can influence such a condition as to imagine, in Sydney Smith's words, that stroking the dome of St. Paul's will soothe the Dean and Chapter. What medicine would one prescribe, for example, for an otherwise perfectly healthy and unusually brave man who had an abnormal fear of cats? Fortunately, treatment by suggestion generally yields brilliant results in cases of obsession.

Psychical Impotence.—An important part of my practice has been the treatment of psychical impotence by suggestion; most of the patients were strong, healthy men, and all were free from any physical sexual defect. Other methods had been tried without result, but, despite this, after treatment by suggestion the married life of most of these patients became normal, and children were born to them. Many of these patients suffered acute mental distress, and keenly felt what they regarded as the shame of impotency; in fact, it is almost impossible to exaggerate the amount of family unhappiness dependent upon sexual disabilities. In most instances the wives intensely desired to have children. These wives were not only unhappy themselves, but often made the lives of their husbands a burden to them by their reproaches.

In my own practice "suggestion" has given curative results equal to those reported by others, despite the fact that the majority of cases treated by me were extremely unfavourable ones. The patients had generally been ill for years, and had become hopeless as the result of the failure of other methods. Many of them dreaded treatment by suggestion, as they had been told that it was dangerous and would destroy their will-power. The contrary, however, is the case; most of the patients I treat have more or less lost their will-power. Dipsomania, morphinomania, neurasthenia, hysteria, obsessions, involuntary muscular movements, all show lack of self-control. *The central object in all treatment by suggestion ought to be the development of the patient's control of his mind and body.* It should be clearly pointed out to him that his disease generally demonstrates the feebleness of his volition: he desires, for example, to stop drinking, but cannot; he wishes to escape from an obsession, but is unable to do so. The treatment by suggestion, which enables him to carry his wishes into effect, does so by increasing, not diminishing, his voluntary control of his own organism.

To associate the idea of danger with such a process is absurd. During the twenty-four years

I have practised suggestion, I have not seen a single instance in which ill effects, even of the most trivial description, have followed its use, despite the unstable mental condition of many of my patients. My experience is shared by others. Thus, Forel asserted that he, as well as Liébeault, Bernheim, Metterstrand, van Eeden, de Yong, Moll, and the other followers of the Nancy School, had never seen a single instance in which mental or physical harm had been caused by the use of suggestion as a therapeutic agent. No complete record of their cases has been published, but the number certainly exceeds fifty thousand.

As the value of treatment by suggestion and its freedom from danger become more fully recognised, it will doubtless be employed in earlier stages of disease. When that day comes the results will be still more striking.

J. Milne Bramwell M.B., C.M.

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MODERN CURATIVE TREATMENTS

It has already been pointed out that perfect health is a relative question, depending necessarily on the individual. It is equally true that disease is to some extent relative, taking a particular character in any given individual, and in this lies the superiority of treatment by a medical practitioner over the best written advice. The same fact also accounts for the apparently strange divergence of results produced by the same curative treatment on different individuals. Massage of the chest is said to have cured a consumptive; but it is safe to say that on most tuberculous subjects its effects would be slightly if at all noticeable. A change of air will at times restore a man to health and yet leave the ill-health of his brother unchanged; or it may happen that a change to bracing air will renew one man's vigour, while it actually tends to weaken another.

The various curative treatments which an increased hope of banishing disease has evolved must not, then, be condemned because they fail to help any given person. For the same disease in another person they may have been used with the happiest results. Equally unreasonable it is to see in the numerous curative treatments a direct and fascinating incentive to experiment on oneself.

A number of curative methods which have been applied in recent years to various diseased conditions are given here. They range from the simplest of all—the change of air—to the electrical and radium treatments, which are still but little known. They have been given so that anyone may see how various, ingenious, and concerted is the modern attack upon disease, and also that a sufferer may see the many ways in which his condition may be improved.

Climatic Treatment or "Air Cure."—This treatment simply consists in sending a patient to a resort where he has the opportunity of breathing exceptionally pure air. Such resorts are as a rule either at the seaside or at a considerable altitude. It is desirable that the temperature should be equable, and that there should be a maximum amount of sunshine. The patient is naturally expected to be out in the open air as much as possible, and while it is beneficial to patients suffering from any disease to be placed in the best climatic environment, it is especially advisable in the case of tuberculous subjects.

Roughly, suitable climates may be grouped into three—that of high altitudes, the dry warm, and the moist warm climates.

Of the resorts at high levels the principal European ones are situated in the Alps—Davos, Les Avants, St. Moritz—but mention may also be made of the Highlands of Scotland as a summer resort. In America the Adirondack cure has become quite famous.

Of dry warm climates the most notable are to be found at the Riviera, Cannes, Nice, Mentone, &c. Other resorts are in Egypt and Algiers, Southern California, and the Southern States of America generally.

Of moist warm climates special notice may be taken of the "Cornish Riviera," and the South of England generally, and the corresponding French resorts in Brittany, the Madeira Islands, the Bermudas, and, in the United States, Florida.

Hydrotherapy and Spa Treatment (with notes on the principal spas of Europe).—Hydrotherapy is the use of water in the treatment of disease, either applied externally in the form of baths or packs or taken internally. The internal use of water, specially when its therapeutic efficacy is largely due to the salts it contains, falls rather to be discussed with drug treatment, but since some reference to this form of hydrotherapy is unavoidable in the description of spa treatment, a brief consideration of the most noteworthy waters and their therapeutic uses may be given.

Internally water is used as follows:

1. Plain hot water has a soothing effect on the stomach, and acts by flushing out the excretory organs and diluting any poisonous substances circulating in the blood. Hence its use in many diseases which need not be enumerated.
2. Saline waters, containing common salt, have a laxative action, and are used in intestinal disorders, as well as in certain joint and bone affections.
3. Water containing the alkaline carbonates neutralises excess of acid in the stomach, and has a diuretic action, and hence is used in stomach maladies and chronic diseases of the various organs, particularly the kidneys.
4. Carbonic acid gas water is effervescing, and is employed for its supposed soothing properties on the stomach.
5. Sulphate-containing waters are purgative in action and taken for constipation and congestive affections of liver, spleen, and kidneys.
6. Waters containing iron and manganese are used in anæmia.
7. So also are arsenated springs, which, in addition, are taken in glandular enlargements, skin diseases, syphilis, &c.
8. Sulphuretted or sulphur waters are laxative and generally stimulating, and are taken in abdominal and rheumatic disorders, as well as in skin diseases, bronchial catarrh, &c. These waters are only employed, however, in chronic ailments.
9. Bromides and iodides in spas are taken for chronic joint diseases, gout, and catarrhal conditions of mucous membranes, *e.g.* bronchial catarrh.
10. Lime salts have an action on uric acid excretion, and are used in rheumatism and gout.
11. The value of lithium waters is questionable.

12. Radio-active waters are drunk as tonic and for catarrhs of various kinds.

In very many instances, in addition to drinking the water, patients are directed to inhale the vapours rising from the thermal waters. Notably is this the custom at Luchon in the French Pyrenees, where it is known as *humage*, the patients sitting round an opening communicating with the wells, from which opening tubes convey the vapour to them.

Coming to the external application of water for diseased conditions, it is convenient to classify baths under three divisions:

1. Hot or cold baths, where the temperature is the principal consideration.
2. Where there is an additional mechanical factor, the water, for instance, impinging on the skin with considerable force, while massage is given.
3. Where the bath is medicated, and effects are got not only from the water, but from the dissolved or suspended chemical agents.

But in any one "cure" or in any one method of hydrotherapeutic treatment we find combinations of these various types, and for descriptive purposes the classification can only be adhered to imperfectly, although the following description is based on it.

Of *hot* baths for medicinal purposes many people are most familiar with the **Turkish bath**, which by inducing profuse perspiration draws off fluids from the body with waste products in solution, stimulates sluggish skin glands, and reduces obesity. The procedure is for the patient, stripped, to enter the first hot room, the temperature of which is about 130° F. There he stays for two or three minutes douching his head with cold water, and then passes to the second room for another brief stay, the temperature here being 170° to 180°. Thence he passes to the third and hottest room of temperature 210°, where he remains five or ten minutes sipping cold water until the perspiration breaks. From there he returns to the second room and the first, staying about ten minutes in each, rather longer in the first room, perspiring freely. He is then shampooed from head to foot, washes himself well with soap and water, and has a needle spray beginning at body temperature and gradually diminished to 60°. After a plunge bath at 60° he retires to coffee and a cigarette in the lounge. The Turkish bath is prescribed for chronic kidney cases, for chronic and local rheumatisms, for skin diseases where there is defective action of the skin glands, and for obesity.

The **Russian bath** is ordered for the same class of patient. It differs from the Turkish bath in that moist heat is used, the patient remaining some twenty minutes in a steam-impregnated atmosphere at 120° F. This is followed by the needle spray, plunge, and shampoo.

The danger of these baths is that they cause considerable alterations in the vascular system, which may react seriously on those with weak hearts.

The **Berthe bath** consists of a small cabinet into which the patient enters, and where he is steamed as in the Russian bath. But the smallness of the chamber permits the use of steam permeated with volatile oils which may invade the skin glands, so that this form of hot bath has an additional use in the treatment of skin conditions associated with malodorous perspiration.

Similar boxes to fit the individual limbs are used in rheumatic and other joint affections to give steam baths, where the limb remains exposed to steam at 120° to 125° F. This is often followed up by salt water sprays.

In diffuse inflammations of the limbs immersion in a hot solution of a mild antiseptic is found to relieve pain, removing the discharge and keeping any wounds as aseptic as possible. The baths last one to four hours, during which the temperature should be raised gradually from 98° F. to 110° F.

An example of a general hydrotherapeutic application for the relief of local conditions is the use of the hot bath in suppression and retention of urine. In suppression or anuria no urine reaches the bladder from the kidneys, a state of affairs most common in acute inflammation of the kidneys (acute Bright's disease). Retention of urine is where the urine is not voided from the bladder because of some narrowing or obstruction in the urethra. In either case the patient is given a hot bath, which often is sufficient to relieve his condition.

Another application of hot water is the old-fashioned fomentation, where a cloth, wrung out of hot water, is placed over some painful area, *e.g.* over the right side of the abdomen in appendicitis, and is often markedly successful in diminishing pain.

Cold baths have also their uses, the most familiar of which is the morning tub indulged in for tonic purposes. It need hardly be said that the important thing about this bath is not the temperature of the water, but the reaction, manifesting itself in the "afterglow" of the skin, to obtain which a tepid bath is often sufficiently cold. Excessive bathing in ice cold water is more likely to be harmful than beneficial.

In disease the cold bath has two main uses—to bring down high temperatures, and in the treatment of typhoid fever.

For hyperpyrexia (where the temperature reaches 106° F.) cold water baths are given in one of four ways:

1. Sponging the patient with cold or iced water, each part of the body being dried immediately after sponging.
2. Sponging the patient with tepid water in similar fashion.
3. Wrapping him in a blanket wrung out of cold water, in which the patient lies until his temperature is approaching normal, when the blanket is removed and the patient is placed in a warm dry bed.
4. Placing the patient in a bath at 80° F., of which the temperature is lowered to 60° F. by the addition of cold water. In this bath the patient remains for fifteen to twenty minutes.

In all these methods it is necessary to watch the temperature, for it should never actually be lowered to normal during the course of the bath.

The cold bath for typhoid fever resembles most the fourth of these methods. It was introduced by a German physician, and is most popular in America and on the Continent. At first it was intended to bring down the temperature, but its stimulation of the kidneys to excretion and its general toning up effect have caused it to be retained as a special form of remedy in typhoid fever. The baths are given at 65° F., and compresses dipped in iced water are applied to the chest and abdomen. The patient stays fifteen minutes in the bath, the limbs and trunk being systematically rubbed by the attendant. Sometimes a number of these baths are given in the twenty-four hours.

Cold compresses, or ice-bags, are sometimes employed locally over congested areas, *e.g.* the ice-bag to the head in apoplexy.

The best instances of the second type of bath, where some mechanical method of treatment is added to the application of water, are the Aix douche, the Vichy douche, the Plombières treatment, the needle bath, and the electric baths.

For the **Aix douche** the patient is seated, stripped, on a wooden stool, and is shampooed or massaged, during which process a powerful jet of hot sulphur water plays upon the part being massaged. It is used with most effect for joint affections, appearing to promote the absorption of the products of inflammation and improve the circulation. Hence the treatment at Aix of all forms of chronic rheumatism and gout.

In the **Vichy bath** the patient is given a general shower bath while he is being massaged, and the form of treatment is rather used for generalised joint affections, the Aix douche being preferred where one or two single joints are diseased. It is needless to say that the masseur in both cases has to work in bathing costume.

The features of the **Plombières treatment** (meaning thereby a special hydrotherapeutic procedure) is the preliminary washing out of the large intestine, and the application of a hot spray to the abdomen. The patient is put a in small room containing a couch, bath, and water-closet. He lies down on the couch on his left side and is given a large enema of sulphur water. After lying thus for a spell, he turns on to his back, and then after a little lies on his right side. Then he rises and expels the enema with other contents of the large intestine. All this is repeated. And then the patient enters a hot bath, and a spray of hotter water is directed on the pit of the stomach. This treatment is credited with stimulating the sluggish large intestine, improving the tone of its musculature, while the enemata remove the contents of the bowel as well as the mucus which is present in the low form of intestinal catarrh known as mucous colitis. Hence this "Plombières cure" is employed in constipation, dyspepsia, &c.

The **needle bath** in modified form is to be found in many ordinary house bath-rooms. It consists of a large number of fine powerful jets which, impinging on the patient's skin, have a generally stimulating effect.

The **electric baths,** faradic, galvanic, and the Schnée cell have been described in connection with electricity.

At practically all the spas where the springs contain definite chemical substances, baths are given, even though drinking of the water forms the main part of the cure. Very often the value of these baths is very questionable, for their active chemical constituents cannot penetrate the skin. But of baths of medicated waters the following are, some of them, certainly useful in treating disease, and others have at least acquired a considerable reputation.

Baths containing such salts as chlorides and carbonates which have an action on the endings of the nerves in the skin, the carbonates having a soothing, the chlorides an irritating effect. Consequently they can be used where such effects are desired, *e.g.* in skin diseases, &c. Included in this category are some of the now world-famous Nauheim baths. The other important constituent in these baths is the effervescing carbonic acid gas which literally tickles the skin, stimulating the sensory nerves and improving the circulation in the superficial vessels. The Nauheim treatment is described at length elsewhere, being the most reliable and most widely practised form of hydrotherapy.

Brine baths are much employed both to produce a general stimulation, and to effect some curative result in rheumatic and other joint conditions. Along with them may be considered sea bathing, which from the physician's point of view is best suited for children, for delicate women, and for neurasthenic men. From it may be derived great benefit to the general health by increasing the metabolism (or common wear and tear in the body), accelerating the various bodily functions, and toning up the nervous system. In some, however, sea bathing induces depression rather than a stimulation, indicating that they are not in a satisfactory bodily state for this recreation or treatment. Depression may also be produced by certain pernicious practices, such as staying too long in the water, especially when the sea is rough, entering the sea when the bather is already chilly, bathing before breakfast on an absolutely "empty stomach," or, what is equally bad, immediately after a full meal. After bathing the circulation should be stimulated by vigorous towelling or exercise. Suitable conditions for sea-bathing treatment are neurasthenia, muscular weakness, nervous exhaustion, tuberculous manifestations in glands, bones, and joints.

Sulphur waters are employed largely in the bath treatment of joint diseases, rheumatisms and gout of the chronic order. It is not clear that the effects are not produced by various other constituents of the waters employed. Possibly the sulphuretted hydrogen in the vapour rising from the baths may be inhaled and ultimately produce the laxative action of sulphides in the large intestine.

Pine baths consist of hot water to which the extract of pine-wood has been added, about ten ounces of the extract of Pinus Sylvestus to the bath, and are prescribed for stiffness in muscles and joints, in catarrhs of the respiratory passages, in neurasthenia, neuralgia, &c., where they have presumably general stimulating properties. When the bath is to be given for the inhalation of the vapour perforce accompanying it, an eucalyptus bath is sometimes employed in place of the pine.

Peat Baths.—Peat is ground to a muddy pulp and is placed in a bath—generally on a level with the floor, and impregnated with steam until the bath is at body temperature, or a little higher—up to 104° F. In this the patient remains for twenty to forty minutes. After coming out he is given a needle spray and is douched with bucketfuls of water by the attendants. It is used as a part of the "rest cure" in general debility, neurasthenia,

&c., and also is of value in pelvic inflammations. It forms a notable part of the Harrogate "cure."

Mud baths are given at many spas, and are similar to the peat bath. The mud of rivers or springs is put into baths impregnated with hot steam. The patient lies so long in this hot fluid mud and then passes through a series of less muddy baths to a bath of ordinary water. These baths act as a "general poultice," no penetration of the minerals through the skin possibly taking place. They also are given at Harrogate and at Marienbad, Dax, &c.

A special variety of mud bath is the **Fango treatment**. Fango is an exceedingly fine deposit found at the bottom of some small lakes in North Italy, which derive their water from hot volcanic springs. This fango can be used in a bath, but more usually is applied as a pack over some diseased part of the body. It adheres closely to the skin, acting as an irritant and stimulating the superficial blood-vessels. It is kept on for from half an hour to an hour and a half as required, and is used mainly in joint and muscular affections, in diseases of women, in anæmia, and other blood diseases, and in obstinate skin affections.

The Liver Pack.—For this course linen bags are filled with bran and mustard, moistened and heated. They are then applied over the liver in front and behind, and are left on for twenty minutes. Afterwards the patient is given a needle spray. This treatment is given two or three times a week for congestion of the liver.

Various other methods of treatment, not hydrotherapeutic, are practised at different spas.

One is the hot air treatment given with considerable benefit for rheumatoid arthritis, for general rheumatism of a chronic type, and in kidney conditions, producing perspiration. The patient, or the part of him to be treated, is wrapped in asbestos cloth or in lint, and is placed in a cabinet and exposed to air raised to high temperatures, 200—400° F. The evaporation from the perspiring skin along with the asbestos or lint prevents the skin being burned. This is the **Greville treatment**.

The combined heat and electric light bath is described under Phototherapy; it is known as the **Dowse bath**.

Not dissimilar is the much more antique **sand bath**, given at Arcachon in France and elsewhere. The patient is placed in a scooped-out hollow in the sand at the seashore and is covered over with damp hot sand. He lies in the full force of the sun's rays, which induces free perspiration, and is supposed to stimulate the skin.

At many spas the hydropathics retain special attendants to give patients medical exercise and gymnastics, the most famous system of which being the Nauheim exercises. The **Terrain cure** is carried out in some German and Austrian health resorts, where several of the roads have been measured and have frequent notices of the distance from the resort placed along them. The altitudes of the road at these different distances are also noted on these signposts, so that the patient may regulate his walking exercise to the doctor's prescription. Uphill walks are certainly of value in the treatment of heart disease, obesity, general debility, always provided that the patient does not overstrain himself.

Certain dietetic eccentricities may be mentioned, the "grape cure" practised at some of the Swiss and Tyrolese resorts, where some two pounds of grapes are eaten daily by patients suffering from dyspepsia, intestinal catarrh, obstinate constipation, &c.; or the very old-established milk-whey cure, milk being so easily digested and of great benefit both in digestive and kidney disorders, while whey has pleasant laxative qualities. The "sour milk" cure with Professor Metchinkoff's bacillus of long life is of the same order.

The "rest cure" is treated fully in connection with the Weir-Mitchell treatment for hysteria.

Life at the Spa.—The patient rises about six and goes to the pump-room for his matutinal drinking. This is by no means a purely medical ceremony, for all the patients are assembled there, a band plays, and generally it is quite a social function. After breakfast at nine, the patient is at leisure till before lunch, when he again drinks the water. In the course of the afternoon those who are having bath treatment generally have their baths. Dinner is at six, and the patient is in bed about ten. Such is the average mode of life, but it is different in different spas.

The main object of spa treatment is to regulate the metabolism of the body and to improve nutrition. The cure of special ailments, though often of importance, may, broadly speaking, be looked upon as subsidiary. And the cases sent to spas should always be in the subacute and chronic stages, never in the acute stage. Nor should convalescents, old people, or children be sent to spas. The treatment is generally rather for the strong than for the weak. The freedom from business and domestic worries, and the regularity of the life, along with the regulation of the bodily functions are in the main responsible for the benefit derived.

HEALTH RESORTS

ENGLAND AND WALES

Bath is a very old health resort, dating back to the time of the Roman occupation. But it has a full installation of the most modern baths, including the Aix douche, Nauheim baths and treatment, needle, electric, hot air, and pine baths, &c. Consequently almost all diseases amenable to hydrotherapeutic treatment can be treated at Bath. It caters largely for patients with joint affections, gout, chronic rheumatism, &c. But indigestion, anæmia, heart diseases are also treated there. Its waters contain mostly sulphates and carbonates.

Buxton has a remarkably low humidity, and has pure bracing hill air. Its bath installation is also very full. The waters are of two distinct varieties—thermal or hot, and chalybeate or iron. The thermal spring is at a temperature of 82°, and highly charged with nitrogen gas and rich in radio-active elements. At this spa rheumatism and gout are mostly treated, but nervous diseases and tropical diseases are also catered for, and for cases of early phthisis and anæmia Buxton has a good reputation.

Cheltenham has a number of springs, alkaline containing carbonates, and those containing sulphates. While there is bath treatment here also, the drinking of the waters is the main part, and the diseases specially treated are disorders of the digestive system.

Church Stretton (Shropshire) has a pure bracing climate, and is frequently repaired to from Bath, Buxton, &c., for an after-cure.

Droitwich.—Here there is a full installation of modern baths. The waters are said to be the most powerful salt waters in the world, and are used in the treatment of joint and muscular affections, heart diseases (as at Nauheim), neurasthenia, anæmia, and some skin diseases, such as the dry forms of chronic eczema and psoriasis.

Harrogate is one of the best-known British spas. It is situated in the uplands of the West Riding of Yorkshire, and has a pure, dry, tonic climate. It has some eighty springs containing sulphur, salt, magnesia, iron, &c. There are four bathing establishments supplying facilities for every method of treatment—Russian baths to the ozone cure. Diseases treated there are anæmia, joint affections, disorders of the liver and digestive system generally, skin diseases.

Ilkley (Yorkshire) has also a bracing climate. It has iron and saline waters, with efficient bathing establishments, and has facilities for the Weir-Mitchell treatment. Joint and bronchitic affections, neuritis, neurasthenia are treated here.

In **Leamington**, or "Royal Leamington Spa," the waters are saline. Electric medicated baths are also to be had. Cases of joint affections, neuralgia, neuritis, some skin diseases, and chronic Bright's disease are received here.

Llandrindod Wells is in Central Wales, has a wide variety of mineral waters, salt, sulphur, iron, magnesium, lithia, which are laxative in action and have also a powerful action on kidneys. Hence diseases associated with digestive derangements, as well as gout and other joint affections, and, most of all, those cases where stimulation of the kidneys and bladder is indicated are treated here.

Llangammarch Wells in Breconshire is unique in Britain as to the composition of its waters, which contain chlorides of lime, magnesium, strontium, and lithium, and barium—this last salt having a stimulating effect on heart muscle. In addition to external and internal hydrotherapeutic measures, a counterpart of the Nauheim cure is carried out here, so this spa is most suitable for heart cases, though cases of gout, joint and muscular rheumatism, goitre, and neurasthenia are also received.

Malvern in Worcestershire has several springs of exceptionally pure water. But it has a comprehensive set of baths, including the Aix douche and Fango mud pack. It is suited to patients suffering from gout, sciatica, rheumatism, bronchial diseases, &c.

Matlock lies in a district that has been described as the Switzerland of England. Its springs are thermal, temperature 68° F., and contain sulphates and alkaline carbonates. The water is therefore very soft to the touch, and especially suited for douches and baths. At Matlock Bath and at Matlock Bank, which is a mile from the Bath, there are several hydropathic institutions where all kinds of physical methods of treatment are given—massage, electricity, light baths, &c. Cases of gout and rheumatism, digestive disorders such as biliousness, chronic Bright's disease, chronic hepatic disease may be sent thither.

Ripon (Yorkshire) has saline sulphur springs, but has now facilities for all kinds of treatment, pine, brine, Nauheim baths, as well as a new electro-therapeutic department. In addition to the usual joint and digestive diseases, special attention is devoted to skin affections.

Tunbridge Wells, in Kent, has a long history as a fashionable spa. It has a mildly bracing climate. Its springs contain iron, with chlorides and sulphates of soda, potash, and lime. It has a complete installation of baths, and at it are treated lung diseases, early heart cases, neurasthenia, melancholia, anæmia, joint affections, &c.

Woodhall Spa in Lincoln has very strong bromine-iodine waters, stronger than those of Kreuznach in Germany. Its hydropathic arrangements have been lately improved, and all manner of electrical and bathing treatment can be obtained there as well as massage, Swedish gymnastics, &c. Cases suitable for treatment are joint and muscular rheumatism, gout, sciatica, neuritis, neuralgia, skin diseases, and diseases peculiar to women.

SCOTLAND

Bridge of Allan in Stirlingshire has a mild and equable climate. The waters are rich in chlorides, but contain a number of salts. There is a fairly complete installation of baths. Patients suffering from chronic derangements of the digestive system, the liver, from chronic rheumatism, sciatica, &c., may be sent thither.

Peebles has thermal springs, the chief constituent salts in which is chloride of sodium, or common salt. The hydropathic has a very full and very modern set of baths. The nature of the waters makes this health resort very suitable for the hydrotherapeutic treatment of heart disease, and the Nauheim cure can be taken here as completely as at Nauheim. Rheumatism, dyspepsia, gout are also treated here.

Strathpeffer is in the north of Scotland at the foot of Ben Wyvis. Its waters contain sulphur and iron, and baths of most reputed varieties are given. To it repair patients suffering from the usual type of complaint, gout, rheumatism, chronic digestive troubles, congestion of the liver, urinary stone, anæmia, obesity, &c.

IRELAND

Lisdoonvarna (Co. Clare) has magnesium, iron, and sulphur springs. Gouty and rheumatic cases, skin diseases, tuberculosius disease of bone, piles receive special treatment here. It is sometimes called the Cheltenham of Ireland.

FRANCE

There are probably more health resorts in France than in any other country in the world. The following are some of the better known and more frequented spas.

In Central France, **Châtel Guyon** and **Vichy. Châtel Guyon** as a spa is of recent growth. It has iron, magnesia, and saline waters, with a laxative effect on the bowels, and a diuretic effect on the kidneys. Patients suffering from chronic constipation and other intestinal affections, congestion of the liver and kidneys, &c., are treated here.

Vichy has both hot and cold springs, containing iron and alkalies. The bathing establishment is under the French government, and is the largest in France. Diseases: Stomach, liver, kidney troubles, anæmia, &c. The water is exported in large quantities, but ought only to be taken on the order of a physician.

In the Pyrenees there are several good spas, and here, too, is situated the famous climatic health resort, Pau. Of the spas there are **Bagnères-de-Bigorre,** where there are iron, arsenical, and sulphur waters, and where anæmia, neurasthenia, hysteria, and gout are principally treated; and **Dax,** where there is an immense hot alkaline spring giving 500,000 gallons per day, where the baths of this water, and more notably mineral mud baths, are given for many varieties of joint trouble, gout, rheumatism, &c.

Luchon has over fifty warm springs containing sulphides, iron, and alkalies, which, in addition to be drunk and used in baths, are inhaled in a special way called *humage*, and thither come patients with chronic bronchitis.

Saint Sauveur, where there are also sodium sulphide springs, is *the* resort of the rich French woman in all maladies peculiar to the sex.

In Savoy the chief Spa is **Aix-les-Bains.** The water contains alkali, lime, and sulphur, and is said to lower the blood pressure and assist the elimination of uric acid. Hence it is employed in rheumatism and gout to a large extent. But skin diseases and catarrhs of the nose, larynx, and bronchial tubes are also treated here, as well as women's diseases. The thermal establishment is very fine and very complete. The most famous application of Aix waters is the Aix douche, described in connection with other hydrotherapeutic methods (p. 308). Another, somewhat amusing, feature of the Aix treatment is the sedan-chair method of conveying patients back to their lodging after the bath. Aix is an exceedingly fashionable spa.

Evian, also in Savoy, is on Lake Geneva, has very pure spring water, the drinking of which is the main part of the treatment given here for gout. There is also a well-equipped hydropathic establishment.

In the Vosges **Bains-les-Bains** is famous for the radio-active properties of its waters. Joint affections, nervous affections, and membranous enteritis are treated here.

The main action of the **Contréxéville** waters is on the kidneys, which it stimulates to free and rapid secretion. This diuretic power is utilised in the cure of kidney and bladder maladies. The water is also exported for medicinal use elsewhere.

Plombières has hot and cold springs of clear, tasteless water, which is very radio-active. Its popularity depends a good deal on the methods of hydrotherapy employed, the most notable of which is described along with other special bath treatments. In addition to stomach and intestinal troubles, female disorders of all sorts receive special attention at Plombières.

Other French spas are **Enghien,** seven miles from Paris, where there is an excellent bathing establishment with sulphur and lime waters, as well as other methods of treatment, electric, &c.; and **St. Amand,** famous mostly for its mud baths for the treatment of chronic rheumatism and skin diseases.

GERMANY

Germany also is well provided with spas, of which the following may be mentioned:

In the Black Forest district, **Baden-Baden,** long an aristocratic health resort. The waters contain a considerable proportion of salt, and are both hot and cold. At the magnificent bathing establishment hydrotherapy in all forms is practised. The Terrain cure also can be had at Baden-Baden. Cases treated are rheumatic and gouty patients, and those suffering from bronchial or gastric catarrh and some forms of tubercle.

Wildbad as a health resort dates from the fourteenth century, and has hot springs at a temperature of 97° F., used both for baths and drinking at this temperature. There are treated rheumatism and gout, neurasthenia, spinal paralysis, rickets, &c.

In the Rhine district is **Ems,** whose waters contain carbonates and chlorides of soda, and also some lithium as well as carbonic acid gas. These waters are used for inhalation and gargling, and from the springs are extracted "Ems Salts." The water is also exported bottled. Catarrhs of all sorts and women's diseases are treated here.

At **Kreuznach** near the Rhine, the springs are noted for their bromine and iodine constituents, in addition to the chlorides of lime, barium, magnesium, lithium, and potassium. Diseases of women, skin diseases, catarrhs of various kinds receive treatment here.

Spas in the Tannus Mountain District are Homburg, Nauheim, and Wiesbaden. The **Homburg** springs have a varied composition. The chief chemical elements are salt, iron, carbonic acid gas, and these are credited with inducing an improved flow of gastric juice with increased appetite, and with stimulating the activity of the bowels. Hence dyspeptics and sufferers from liver complaints and gout are the principal frequenters of this fashionable spa.

The very important **Nauheim** cure is described at length elsewhere.

The **Wiesbaden** springs arise at the high temperature of 144° F., and contain common salt. Here are treated chronic gout and rheumatism, syphilitic affections, and chronic pelvic disease.

Schwalbach in Nassau, has cold iron-containing springs, effervescing with carbonic acid gas. Mud baths are a specialty. This is *par excellence* a resort for diseases of women, anæmia, sterility, exhaustion after confinement, and loss of blood, hysteria, neurasthenia, &c. "The Iron Cure of Germany."

Other German spas of note are Aix-la-Chapelle, Kissingen, and Wildungen. **Aix-la-Chapelle** in Rhenish Prussia in addition to being a spa, is full of historical associations. Its springs are rich in sulphur, and contain also carbonic acid gas and common salt. This spa is almost wholly given over to the treatment of syphilis and parasyphilitic *sequelæ.* Gonorrhœal rheumatism, gout, and skin diseases are also treated here.

Kissingen in Bavaria is known best from the fact that it so largely exports its waters. Its springs contain salt, and are used in the treatment of diseases of the alimentary tract.

At **Sulzbrunn** in Bavaria, or Iodbad Sulzbrunn, the waters contain iodide of magnesium in combination with salts of sodium, and are utilised in the treatment of tuberculosis of glands, bones, and joints, rheumatism, gout, skin diseases, syphilis, &c.

Wildungen in Waldeck has waters which have long been known for their beneficial stimulation of the kidneys and solvent action on urinary stone. The springs are alkaline, and contain iron. The water is used for diseases of the kidney and bladder and urinary passages. It is bottled and exported in two forms—the Helenen-Quelle alkaline water, used also for intestinal disorders, and the Georg-Victor-Quelle, containing more iron and hence of value in anæmia.

AUSTRIA-HUNGARY

Baden is an old Roman health resort, and, quite near Vienna, is now fashionable as an Austrian watering-place. The waters contain sulphur, and there are large common baths accommodating twenty to thirty ladies and gentlemen at the same time, though there are also small baths. There is also a complete hydropathic installation of the latest type, as well as unnumbered places and modes of amusement. Diseases treated here include chronic joint diseases, skin diseases, syphilis, urinary diseases, and diseases of women.

Budapest has in its environs manymineral springs, of which the most notable is the Hunyadi Janos, of which the waters are bottled and exported. The springs contain iron, sulphur, and salt, and among other diseases are used for those of women especially.

Carlsbad in Bohemia is a spa of cosmopolitan fame and of very considerable historical antiquity. The waters contain carbonate of soda, sulphate of lime, and are thermal, ranging in temperature from 95° F. to 160°. Here are to be found all varieties of baths, and it is estimated that about 60,000 visitors come to take the cure annually. The conditions specially treated are all kinds of disorders of the alimentary tract, from dyspepsia to piles, diseases of the liver and spleen, kidneys, and uterus, general adiposity. In addition to the hydrotherapeutics, the diet of patients receives very careful attention.

Franzensbad (Bohemia) has alkaline iron waters, but its special feature is the mud bath. The mud contains alkaline sulphates, with some lime and phosphate of iron. The frequenters of this spa are mostly women, anæmia, chronic uterine disorders, neurasthenia, &c., being especially treated.

Wilbad-Eastern on the Austrian Alps, is largely frequented by old people. The feebly mineral waters have a sedative effect on the nervous system, with a certain degree of general toning up. Nervous troubles, rheumatism, hypochondria are some of the conditions treated.

Marienbad in Bohemia is another very popular spa, the yearly visitors being estimated at 30,000. The waters contain iron and alkaline sulphates, and have diuretic and aperient properties. *The* malady treated at Marienbad is adiposity, but dyspepsia, gout, biliary, and kidney stones are also treated. The water is bottled and exported.

Roncegno in the southern Tyrol has the most powerful known arsenic springs, which contain, in addition, salts of iron and magnesium, and hence are employed in all blood affections which respond to arsenic mediation, as well as in other disorders, such as gout and rheumatism, and in general debility. The water is bottled and exported. It is a clear yellow fluid, easily assimilated, ranging in dose from a teaspoonful for a child to a tablespoonful for an adult. Roncegno is well equipped as regards electricity, gymnasium, &c., where other physical-method treatment can be combined with the bath cure.

Balatonfüred in Hungary has waters rich in iron and containing carbonic acid gas. Here diseases of women are specially catered for.

Pöstyén in Hungary has hot sulphur springs, from which a fine radio-active mud is derived, employed in the treatment of rheumatoid arthritis, sciatica, syphilis, &c.

SWITZERLAND

In the Engadine the three spas are Ragatz-Pfäffers, St. Moritz, Tarasp. **Ragatz-Pfäffers**, at an altitude of 1700 feet has waters rich in alkaline carbonates, sulphates, chlorides, bromides, and iodides, with tonic and digestive properties; hence their use in dyspepsias and other alimentary disorders, nervous diseases, &c.

St. Moritz, some 6000 feet above sea-level, has cold iron springs, and is a resort for anæmic and debilitated patients. Uterine and vaginal catarrhs and nervous affections are also treated. Its altitude and bright cold make it a favourite health resort, though not suitable for phthisical patients or those with feeble circulations.

Tarasp springs are peculiar for one constituent, sodium iodide; but iron and alkaline salts are also present in the water. Anæmia, and as a speciality kidney and bladder troubles, dyspepsia, liver complaints, nervous debility receive treatment here.

In the Rhone Valley there are spas at Aigle-les-Bains, Bex, Acquarossa, Louèches-les-Bains. At **Aigle** are salt waters. It is a quiet resort, fitted for neurasthenics and cases of nervous debility generally.

Bex has also salt springs, in which are also found the chlorides of lime and soda, as well as bromine, iodine, and magnesia. There are also sulphur springs. Children with tuberculous liabilities, or generally delicate and anæmic, neurasthenic, and rheumatic patients are treated here, also the disorders peculiar to women.

At **Louèches-les-Bains** there are arsenic and iron waters, whose main chemical constituent, however, is sulphate of lime. Diseases treated are chronic joint affections, anæmia, and neurasthenia, uterine and skin diseases. At the spa the old custom of prolonged bathing is retained, the patients remaining for some hours together in large common baths.

Acquarossa has thermal springs containing a wide variety of mineral salts of iron, arsenic, lime, magnesium, manganese, &c. Also there is a supply of medicated mud, which is utilised, as are the waters, for skin diseases, anæmia, and neurasthenia, gout, &c.

In the Jura district are Baden, Schwiznach-Bad, Yverdon.

Baden (bei Zurich) has an abundantly flowing supply of sulphurous water, used for rheumatic affections of all sorts, gout, and the stiffness consequent on bone or joint injuries.

To **Schwiznach-Bad** come a large number of English visitors. It has thermal sulphur waters, and a fine bathing establishment, used in skin diseases, joint affections, &c.

Yverdon is unique in Switzerland for its alkaline sulphurous water, which is used in diseases of bones and joints, sciatica, skin diseases, respiratory diseases.

ITALY

Baths of **Lucca** in Tuscany have radio-active waters, used for kidney and urinary disorders internally, and in bath form for joint diseases, muscular rheumatism, neuralgia, &c. Mud baths are a feature here.

Montecatini has the most noted saline waters in Italy. Here are treated alimentary and kidney disorders.

Monsummano has thermal baths and an important vapour bath establishment. Rheumatism, gout, Bright's disease, &c., are suitable cases for treatment.

Salsomaggiore in Parma has waters rich in iodine, bromine, strontium, and lithium, as well as common salt. Joint affections, anæmia, women's diseases receive treatment here.

Sirmione on Lake Garda, **Valdieri** in Piedmont, have sulphur waters which are used for the same diseases as the foregoing.

OTHER SPAS

Belgium.—Spa.—As a watering-place of celebrity Spa dates back to the fourteenth century. The springs are iron-containing and are diuretic. They are therefore employed in anæmia and neurasthenia and general debility.

Luxembourg.—At **Mondorf** there are strongly radio-active springs, which contain also chlorides, bromides, and iodides, and are rather laxative and mildly tonic in action, hence employed in chronic indigestion of intestinal origin, habitual constipation, debility, &c. There is an installation of all modern forms of baths—electric, peat, &c.

Spain.—Carabaua, some thirty miles from Madrid, has waters whose main chemical constituent is sulphate of soda, and whose action is therefore purgative, hence their use in dyspepsia and in dropsy of cardiac and other origin. There are also treated leucorrhœa, endemic dysentery, &c.

THE NAUHEIM CURE

This cure comprises a treatment of chronic diseases of the heart by means of mineral baths and exercises, elaborated in the first place by two brothers, Drs. Theodor and August Schott of Nauheim, and sometimes known as the Schott treatment.

Baths.—The Nauheim waters, used in the baths, and also for therapeutic drinking, have a deep subterranean origin. Various analyses have been made of these waters. There are several springs with differences between each, but the main chemical constituents to which most importance is attached are the chloride of sodium (common salt), chloride of lime, iron peroxide, and the carbonic acid gas. Some of the springs are devoted entirely to baths, the water of others is used entirely for drinking—notably the Kurbrunnen and the Carlsbrunnen springs.

The temperature of the bath waters is naturally such that it seldom requires modification either in the way of heating or cooling. The course of baths as a rule begins with the Great Sprudel water, where the temperature runs about 88° F.—"thermal" baths so far rid of their natural gas as to contain an opaque yellow deposit of iron peroxide and carbonate of lime. Later the bath has added to it one to three or more litres of Mutterlange, the water from the neighbouring saltworks, from which no more salt can be crystallised out, and which is rich in bromine and the chloride of lime.

From this bath the patient advances to the Thermal-Sprudel baths, which are intermediate in strength between the first baths and the Sprudel bath proper, drawn from springs No. 7. or No 12, which differ some seven degrees in temperature, No. 12, the hotter, being about 95°. These baths retain enough effervescing carbonic acid gas to hold all the iron salts in solution. From this bath the patient emerges covered with the minute gas bubbles, with a pleasant redness of the skin, and general warm glow.

Finally he passes to the flowing baths, to which most value is attached by the physicians. Here the waters of spring No. 7, or No. 12, or No. 14 are poured forcibly into the bath during the whole time the patient is in it. "These, with their rising and simmering globules, emerging from water of crystalline clearness, convey the impression of a bath of champagne," and are said to produce a corresponding impression.

The maximum of successive baths permitted to a patient is one daily for five days. After that he must intermit a day. Cautiously regulated general massage may advantageously be given after each bath, more especially in cases where there is much "œdema," *i.e.* lymph "water-logging" the tissues owing to the heart's inability to drive it on.

The effect of the first few baths is to produce a sense of oppression over the heart, causing the patient to breathe slowly and deeply for two or three minutes. This, however, soon passes off, the breathing becomes easy and remains slower, the respirations being now two to four less per minute than before immersion. There is also a general stimulation of the whole circulating system, manifesting itself in the redness of the skin and general warmth. The circulating system becomes more capable of carrying the blood in it, and there is consequent relief to the overworked heart. The rate of the heart-beat is lowered, and its strength is increased. The universal improvement in circulation means that the blood-vessels to the heart muscle are also fulfilling the function better. Hence an opportunity is given for the restoration of the weakened or damaged heart tissue to its normal.

The added carrying capacity of the circulation brings relief also to the congested lungs, liver, and pelvic organs. And the process of relief is accelerated by a marked increase in the amount of urine passed after the first few days of bath treatment.

There is a rehabilitation of the nervous mechanism governing at least the circulatory system, and probably more generally. This effect, it is suggested, is produced by the stimulation of the free gas in the waters as well as of their mineral constituents, and this theory is corroborated most remarkably in the cases of anæmia, and neurasthenia without cardiac lesions, which have undergone the Nauheim cure.

The general immediate effect of a bath is to inspire a sense of well-being and physical fitness, followed by an agreeable feeling of fatigue, which quite reconciles the patient to the hour's rest which he is compelled to take after his bath. A less agreeable result is occasional pain at the joints, sometimes even accompanied with swelling, where there has been any rheumatic or kindred affection previously. As a rule this joint pain and swelling disappears in a few days, although it may persist and become worse with each bath the patient takes.

It is well to notice that there is no special virtue in the origin of the waters, nor in the locality of Nauheim. Similar, if not the same, results can be obtained with baths of ordinary water to which the main chemical constituents of the Nauheim waters have been added, and which of course is at a similar temperature.

Hence the treatment may easily be carried out at home, at a hydropathic, sanatorium, or any other suitable establishment. It is commenced with weak salt baths, of which the temperature ranges from 92° to 95° F., the strength being one pound of common salt and an ounce and a half of chloride of lime to every ten gallons of water. These may be given, say, every other day for a week, the period of immersion to be about six minutes.

This strength is little by little increased, until to every ten gallons of water, three pounds of salt, and four and a half ounces of chloride of lime are used, the patient staying in the bath twenty minutes, with the temperature of the water as low as 85°, if he can bear it. After two or three weeks' treatment, the patient advances to the effervescing baths, in which to every ten gallons of water two ounces of sodium bicarbonate ("baking soda") and three ounces of hydrochloric acid are added just before the patient enters. It is possible to vary the rate of onset of effervescence produced by the addition of these two chemicals thus: To produce a slow and gradual effervescence the bicarbonate of soda is first dissolved, and a bottle containing the acid is placed at the bottom of the bath. The stopper is withdrawn and the bottle is moved about gently from time to time. The bath will be ready in about three hours. To produce a rapid, brisk effervescence the stopper is loosened, but not withdrawn until the mouth of the bottle, turned upside down, is just below the surface of the water. The stopper having been withdrawn, the bottle is moved about over the bath in order to spread the acid widely and produce as even an effervescence as possible. This bath can be prepared in five minutes. The baths can be obtained at different stages of effervescence. The actual amount of effervescence will vary with the amount of reagents used, and gradually one may increase the strength to eight ounces of sodium bicarbonate and twelve ounces of hydrochloric acid per ten gallons. It is useful to keep in mind that hydrochloric acid is a corrosive acid, and unless the bath is of porcelain it is wise to make sure that the full amount of the alkaline bicarbonate of soda has been used in order that the acid may be neutralised and prevented from corroding the metal of the bath.

Acid tablets and packages of the alkaline powder, as prepared by Dr. Sandow, are most convenient for general use, as they are made up to the correct quantities for the baths.

With the bath treatment is associated the performance of the exercises, which have a far less powerful and much slower effect than the baths. Hence in some cases it is necessary to begin the patient with exercises, and only after about a fortnight or three weeks may he be permitted to take the baths.

Resistance Exercises.—These exercises comprise a set of movements which are designed to engage in successive and regulated action almost every system of voluntary muscles in the body. Each movement is resisted by a trained attendant to such an extent as to resist without arresting it. It is then in the attendant's power to vary the amount of resistance and so increase or decrease the speed at which an exercise is performed. The operator guides himself in this respect by noting the effect on the pulse. The strain will be greater, the slower the rate of movement. But the rate is always slow—as a rule about thirty to forty seconds for each movement, with a pause of thirty to sixty seconds between each. Each exercise is performed once, there is no repetition.

The first ones are always commenced most cautiously, and must be the simpler ones, for the very semblance of fatigue is to be avoided. The patient must breathe slowly and regularly. If he is inclined to hold his breath, he should be told to count regularly in whispers, which will almost certainly regulate the respiration. But throughout he must be watched for any sign of embarrassment either of the heart or of the respiration—breathlessness, or rapid breathing, blueness, or pallor of the lips and cheeks, dilatation of the nostrils, yawning, moisture on the forehead. Should any such sign arise, the exercise must be instantly stopped. The part being exercised is either left to hang at rest, or is supported in position by the operator, who avoids grasping the part so as to produce any constriction. During the exercises the operator accomplishes the resistance by placing his hand on the aspect of the patient's limb or trunk towards which the movement is directed.

As in the case of the baths, there are striking results. The heart beat is slowed and becomes more forcible; the congestion of the circulation and engorged organs is relieved, the patient loses his blue colour; there is a toning up of the nerves of the circulatory system; and a general new feeling of lightness and fitness.

There are two sets of exercises employed in the Nauheim cure, of which one may choose either—

those employed by Dr. Schott, or those employed by Dr. Groëdel.

A. Those given by Dr. Schott comprise a set of nineteen exercises, arranged in an anatomical order from which the physician may choose a certain number, choosing those which he finds will best suit the state of his patient each day. Save for some six exercises, Nos. 6–8, and 12–14, the patient can carry out them all while lying down. The whole series will occupy about half an hour.

1. The arms are held horizontally from the shoulders in front of the body, the palms meeting each other. The patient then moves the arms outwards, maintaining them level with the shoulders until they are in line with each other from each shoulder. They are then returned to the starting-point, the operator resisting the movement in each direction.

2. The arm and hand hang from the shoulder with the palm of the hand looking to the front, and the forearm is bent upwards on the upper arm, until the fingers touch the shoulder. The arm is then straightened again. The position of the upper arm does not change throughout this exercise, which is carried out first with one arm and then with the other.

3. The arms, hanging as before with the palm looking forwards, are raised outwards and upwards until they are perpendicular above the shoulders and the thumbs meet. They are then lowered again.

4. The fingers are closed at the first finger-joints and the backs of the fingers of the two hands are pressed against each other, the tips of the thumbs meeting in front of the body, the hands hanging at the lowest position possible (without stooping or bending). The arms are raised (with the hands in this position) until they are above the head, and then returned to their original position.

5. The arms are placed by the side in the position of "attention," and are raised forwards and upwards until they are perpendicular above the shoulders—being parallel to each other the while. They are then brought back to the position of "attention."

6. The trunk is bent forwards, then raised to the upright posture again, the knees not being moved. At this exercise the operator should ask the patient if he has any strange "feeling in the head," any such sensation being an indication for stopping this exercise.

7. The trunk is rotated first to one side and then to the other, and then back to the original position, the feet remaining fixed throughout.

8. The trunk is bent first to one side as far as possible, and then to the other side, and then returns to the upright posture. Here also the feet must not be moved.

9. The fists are firmly clenched and the arms are held out in front of the body as in No. 1, and are carried through the movements of the first exercise.

10. With clenched fists the forearm is bent and straightened on the upper arm as in No. 2.

11. The arms are held in the position of attention, and are raised forwards and upwards until they are vertically above the shoulder. The palm of each hand is then turned outwards and the arm brought downwards and backwards until they resume the attention position. This rotatory movement is performed by each arm in succession.

12. The arms once more start from attention, and are moved backwards and upwards as far as the patient can without bending the spine, then return to the attention position. It has been recommended that the patient face a looking-glass during this exercise in order that the operator may watch for any expression of strain.

13. The patient stands with the feet together, and using a chair, or any other suitable object, as a support, bends up his thigh at the hip as far as he is able, and then straightens it to its original position. It is important to note that he leans with one hand on the supporting object and raises the opposite thigh. Thereafter he uses his other hand to support himself and exercises the other thigh.

14. Supporting himself as in Exercise 13, the patient moves the whole limb, keeping it straight, as far forward as possible, then backwards as far as possible, then brings it back to the original position. Thereafter he performs a similar exercise with the other leg.

15. The patient supports himself with both hands on the back of a chair, and bends up the leg at the knee, the thigh being kept rigid, then returns it to the starting-place. Thereafter the other leg goes through the same exercise.

16. Resting with one hand on a chair, the patient moves his opposite leg outwards from the hip as far as he can, and then brings it back. A similar movement is then performed by the other limb.

17. The patient, holding the arms horizontally outwards, rotates them forwards and backwards at the shoulder. The operator meanwhile offers resistance, grasping the arms at the wrists.

18. The hands, held out in a straight line with the forearm, are bent backwards and then forwards as far as possible, and then resume their original position.

19. The feet, held in their usual position, are bent downwards and then upwards as far as possible, and then are restored to their position at commencing.

This description of the exercises omits the part played by the attendant, who has a quite definite rôle in each exercise. He must know, for instance, at what part of the moving limb or trunk he is to apply his resistance, and with what part of his own hand.

B. The second set of movements, devised by Dr. Groëdel, are arranged so that a beginning is made with the most simple, least fatiguing exercises, from which the patient proceeds to the more complex, more tiring movements.

Group I.—1. Closing and opening of the fingers.
2. Moving the hand up and down at the wrist.
3. Moving the foot up and down at the ankle.
4. Bending and straightening the elbow.

Group II.—1. Rotation of the forearm, the arm being held straight from the shoulder.
2. Raising and lowering the arms to the level of the shoulders only.
3. Bending and straightening of the knee.
4. Arms raised in front of the body to the level of the shoulder, and lowered again.

Group III.—1. Arms, held horizontally from the shoulders, are moved forwards and backwards.
2. The legs, held straight out, are turned outwards and inwards, the patient occupying a sitting position.
3. Raising and lowering of the arms to full extent, hands meeting above the head.
4. Moving of the leg outwards from the hip and bringing it in again, the patient sitting.

Group IV.—1. Raising of the arms in front of the body above the head, and then lowering.
2. Raising and lowering of the thigh at the hip, the knee being held bent, the patient sitting.
3. Swinging of the arm backward and forward from the shoulder.
4. Bending of the body and resumption of the erect attitude.

Group V.—1. Raising of arms in front of body to shoulder level, the arms being held straight and the fists clenched.
2. Bending and straightening of the thigh, the patient supporting himself on a chair with the hand of the opposite side.
3. Bending and straightening of the neck.
4. Twisting of the body from side to side.

Group VI.—1. Bending up and straightening of the thigh at the hip, the knee being kept straight, the patient sitting or lying.
2. Turning of the head from side to side.
3. Bending of the trunk to the side and backwards.
4. Movement of the leg outwards and inwards from the hip, the knee being kept straight, the patient standing, supporting himself on a chair.

Group VII.—1. Sawing—swinging the arm backwards and forwards, bent at the elbow, the hand closed as grasping a saw.
2. Moving of the leg backwards and forwards, the knee being held straight, the patient standing.
3. Raising of the trunk, the patient lying down.
4. Bending up and straightening of the thigh at the hip, the patient lying down.

In the after-treatment these exercises may be performed with "self-imposed resistance." The patient becomes his own operator. He creates the resistance by hardening firmly the muscles with which he is carrying out his exercise, as, for instance, the muscles of the forearm may be clenched by clenching the fist. After practice the patient can induce this hardening of the muscles at will, and can sustain it through several exercises, especially those of the arms and legs.

The Nauheim treatment is not an infallible cure of all forms of heart disease. Very emphatically there are some cases which are not in the least improved. Indeed cases of heart disease have been classified with respect to the Nauheim treatment into four divisions—

1. Those which can be promised a lasting cure.
2. Those which will not be cured, but much benefited.
3. Those in which any change is doubtful.
4. Those which are utterly unsuitable for the treatment.

1. Of the first class, the dilated, weak, easily excitable heart, such as follows influenza, and may defy alike treatment by drugs or rest, is immensely benefited, and can be restored to the normal. So also may the weak hearts produced by prolonged debilitating illness, such as typhoid fever or malaria, or by excessive smoking.

2. In the second class are included a large group of cases where an enlarged, enfeebled heart is the accompaniment of the high arterial tension of rheumatism or gout. This high pressure is the result or concomitant of the diseases, and the incurability of the disease entails the impossibility of radically curing the heart affection. On the other hand, if the patient can afford to undergo the Nauheim treatment once a year for two or three years, and thereafter every second year, there is a hope that the patient will be lifted from the border of invalidism to a condition of moderate health.

This class also comprises cases where the heart valves are already irremediably diseased, and where there are signs that the heart is beginning to be unfit for its work, breathlessness, palpitation, &c. While a complete cure is out of the question, a course of baths and exercises will usually bring about a more permanent improvement than any other line of therapeutics.

3. Among the cases where lasting benefit is a matter of doubt are the more advanced cases of valvular disease. When other lines of treatment have failed, it is, however, only wise to recommend Nauheim treatment. But in such cases the most scrupulous attention must be paid to the carrying out of the treatment, for a slight excess of resistive force in the exercises, a slightly overlong stay in a bath, may make the difference between success and failure.

4. Cases not suitable for treatment are habitual heavy drinkers, those who have a syphilitic heart affection, those whose arteries are markedly degenerated, and generally very old people.

Patients suffering from some other diseases have also been much improved at Nauheim. In some forms of anæmia, in some forms of asthma, in Grave's disease or exophthalmic goitre, where the patients prefer the baths to be at a lower temperature than do the heart cases ; and in Raynaud's disease, where there is a spasmodic narrowing of the small arteries in the extremities, interfering with the blood supply of the fingers and toes, and sometimes inducing gangrene.

Medically the Nauheim treatment is found to diminish the actual size of the heart, to lower the blood pressure in the arteries, to slow and steady the pulse, and to improve generally the whole tone of the circulation and so of the body. But most striking to the ordinary observer is the mental effect produced on the patient by the complete banishment of the irritability, poor concentration of mind, depression of spirits in which he formerly lived.

The "after-cure."—Whether or not it be that the Nauheim treatment is accompanied by a certain amount of strain, the fact remains that after the cure there is left a liability to lassitude following on any kind of physical or mental exertion. And in spite of the patient's renewed circulatory vigour, he is not in a state to return at once to his full work. Hence for two or three weeks he devotes himself to an "after-cure," for which certain *desiderata* have been premised—freedom from business and domestic responsibilities, pure air and sunshine, opportunities for gentle outdoor exercise. Hence the patient is often sent to some health resort with a good southern exposure at an altitude of 1000 to 3000 feet. This question of altitude is of especial importance, for where there is anæmia, a moderate altitude is a good thing, and where there is high blood pressure a low level is necessary.

Walking exercise, too, may be indulged in, and some physicians recommend a series of walks on graduated inclines. But patients who have valvular disease, with shortness of breath, should confine their energies to the level. Throughout this period of after-cure the patient may go on with his exercises, providing his own resistance as indicated above.

THE WEIR-MITCHELL TREATMENT

This is a method of general treatment which is used in cases of hysteria with excellent results, and also with considerable benefit in other nervous diseases. It was devised first by an American physician, Dr. Weir-Mitchell, and it is now known by his name. The treatment consists in utter seclusion of the patient, rest in bed, certain forms of diet, which, as a rule, entail overfeeding, massage (or manipulation), and electricity; and pervading and overshadowing all the details of the treatment is mental suggestion on the part of the physician, to which the patient is made more susceptible than in any other surroundings.

1. **Seclusion.**—It is essential for many reasons that the patient—generally a woman—should be removed from her home to a suitable nursing establishment. If her means allow of it, she may go to a nursing home; if not, she may go to a general hospital, where, with the aid of screens, a satisfactory degree of isolation may often be attained. To quote Weir-Mitchell, the patients belong to "the large and troublesome class of thin-blooded and emotional women, for whom a state of weak health has become a long and almost, I might say, a cherished habit. For them there is no success possible until we have broken up the whole daily drama of the sick-room, with its little selfishness and its craving for sympathy and indulgence." Attempts have been made to carry out this isolation in the patient's own home, but the difficulties and complications are enormous.

Naturally a very important factor in the success of this seclusion is the personality of the nurse. Quietness and firmness of manner, intelligence, a bright and cheery disposition, are the minimum of the necessary qualifications. Furthermore it is an advantage if she has mastered the art of massage, which saves calling in an additional attendant in the shape of a masseur or masseuse.

This isolation varies in its completeness with the requirements of each case, but to illustrate to what degree it may usefully be carried, the patient in an ordinary case is forbidden even to receive letters from home, or if such letters are to be received they must be mere bulletins, containing no news, however trivial, that might excite or annoy a hypersensitive patient.

2. **Rest.**—This is to be both physical and mental. The patient is put to bed and has to remain there throughout the greater part of the treatment. This is necessary to obtain the desired degree of isolation, but the prolonged muscular relaxation and mental repose are very valuable. In the more severe cases the patient remains in bed from six weeks to two months, and at first may not sit up or sew or read or write or "use the hands in any active way except to clean the teeth"; in cases of weakness the patient is even fed by the nurse. After a fortnight or so the patient is allowed a little more activity, but it is surprising how seldom the monotony of absolute stillness in bed is irksome. The comings and goings of the nurse with food, the daily general sponging, the visit of the doctor, the massage, the application of the electricity, all brief incidents in themselves, appear to fill in the patient's day satisfactorily.

After a suitable period the patient is allowed to sit up in bed, and then to get up for a few minutes. This time "up" is gradually extended until she can be out of bed for the greater part of the day. But even after the treatment is over, the patient is advised to rest two to three hours every day for the next two months—this daily rest being understood to mean seclusion, *i.e.* complete freedom from any emotional or mental disturbance such as visitors, household duties, &c.

3. **Massage.**—The effects of prolonged inactivity on the system at large have some undesirable features, and these have to be counteracted by means of general massage combined with passive movements. This is begun three or four days after the patient is put to bed, when she is accustomed to the routine of her surroundings. It is carried out by the nurse or by another, who is a trained masseuse. Dr. Weir-Mitchell begins with half an hour each day, increasing to about an hour, and kept up over a period of six weeks, and then the rubber or nurse is directed to spend half an hour on exercising the limbs as a preparation for walking. This is done after the Swedish plan, the patient advancing from passive movements to active movements of the limbs, and finally to resisted active movements. The patient is recommended to keep up these movements even after the cure is completed.

Electricity may or may not be utilised as an adjuvant to massage in keeping up the general muscular tone. In order to exercise the muscles with the minimum of pain and annoyance, the faradic or interrupted current is used—with interruptions as slow as one in every two or even five seconds. With a clever operator, and when the patient has become accustomed to the current, a more rapidly interrupted current is employed. The operator wraps the poles in cotton wool soaked with salt water, and places them some four inches apart on the surface of each muscle in turn. They are moved sufficiently quickly to permit of a good contraction in each muscle, the smaller electrode rests on the "motor-point" of the muscle, the other being moved about in different directions. The legs, back, abdomen, chest, and arms are gone over systematically, the neck and face being omitted. About forty minutes to an hour is the necessary time to get over all the "external" muscles in this way.

Though this electrical treatment is inferior to massage as regards its general results, it still is very valuable, at the same time bracing up and soothing the patients. Occasional cases do, however, occur where insomnia and nervousness are produced by it.

Diet.—The keynote of the dietetic course is overfeeding, but this ideal is naturally modified by the condition of the patients. There are some hysterical people who are already too stout in an unhealthy fashion. For them a diet is required to rid them of their obesity ; for the remainder, however, overfeeding.

Where adiposity is to be reduced, the staple diet is skim milk—milk from which all the cream has been removed. The patient meantime is confined to bed, and receives general massage daily. If any signs appear to indicate that these measures are more than the patient can bear, small quantities of other foods may be added. This skim-milk diet is only persisted with for a few days, and then, slowly other non-fattening foods are given in addition. Swedish movements may be added to massage, if the patient is strong and in good condition.

But the routine is overfeeding. Many of the hysterical patients are confirmed dyspeptics. This dyspepsia is dispelled by a week of milk diet. Fifty to a hundred and fifty ounces every day, and then the patient goes on to a régime of three meals per diem. And these meals consist of plain nourishing foods, as much as the patient can take. Butter and cod-liver oil—the two most easily absorbed fats—are also ordered. Between meals as well as with meals, the patient has to drink large quantities of milk—as much as eighty ounces per day. And many physicians prescribe, along with the milk, meat juice.

As the patient becomes more fit for ordinary foods of all sorts, the amount of milk may be diminished. The important thing is that the patient should increase in weight. This increase takes place most markedly in the first ten days, later it progresses more gradually.

In addition some physicians employ hydrotherapy, or bath treatment. This takes the form of cold baths or cold douches or sprays in the morning for those who can stand it, and for weaker patients the "wet sheet." The attendant dips a sheet in water at about 70° Fahrenheit, wrings it out, and then applies it to the patient from the shoulders downwards. The whole body is rubbed with the sheet and then thoroughly and firmly dried with a large, rough, warm bath towel. No such cold-water methods are of any good unless they are followed by a reaction "glow." Baths are no part of the original Weir-Mitchell treatment. Nor are drugs, which, however, some physicians have great faith in.

Strangely enough, the predominant factor in the cure of hysteria receives but slight special notice from the originator of this treatment—the effect of suggestion. It will be borne in upon the patient by his or, more often, her whole surroundings that the disease is eminently curable, but furthermore it is the rôle of the physician to convince the patient of this. The patient's confidence must be gained, and the story of her ailment and her ideas of the cause must be fully comprehended. The doctor then explains in plain language that the malady, though undoubtedly serious to the patient, is not springing from any bodily trouble and can easily be cured. His authoritative statement has often to be backed up with a demonstration of the absurdity of some of the patient's ideas and with references to her ordinary occupations and pleasures which may inspire her with a desire for recovery, and combat her general depression. Naturally all this suggestion and persuasion are spread over a succession of visits, and repetition may be necessary before the patient is convinced.

Hypnotism is not included in the Weir-Mitchell treatment, but is employed by a few doctors. Its use is deprecated by many, as attended by risks and sometimes actually harmful.

After the treatment is at an end it is important to prevent the patient from returning to the environment and mode of life in which she developed her hysteria. That is courting a relapse, and the patient must arrange to lead a life on rational hygienic principles.

Designed as a cure in hysteria and neurasthenia, it has been employed as a palliative form of treatment in such nervous diseases as locomotor ataxy, and in addition it very obviously can be utilised as a "rest cure" for those ill-defined "breakdowns" attendant on the bustle of modern life.

SANATORIA AND SANATORIUM TREATMENT FOR CONSUMPTION

Sanatoria are open-air establishments for the treatment on open-air lines of cases of consumption which are either curable or at least capable of very great improvement. Consumptives who are seriously ill are not suitable cases, and ought to be treated at home or in hospitals.

Certain requirements have been found necessary in the sanatorium as regards locality, site, and architecture.

It is found that the localities where consumptives are most benefited have, first, pure air, uncontaminated with the dust, smoke, and other impurities associated with thickly populated districts; secondly, a fresh, bracing climate with, however, adequate protection from cold wet winds; thirdly, sufficient fine mild weather to make an open-air life agreeable —though artificial shelter may condone deficiencies in this respect; and, fourthly, a well-drained, dry soil. These are the essential conditions as regards the locality of the sanatorium—high altitude, dry atmosphere, equable temperature are useful, but of minor importance. The Alpine environment, once considered almost necessary for proper sanatorium treatment, is now known to be unessential, and involves a journey which may be full of risks to the patient. As satisfactory climatic conditions may be found in this country, further treatment at home will obviate the peril of the relapse occasionally overtaking a patient on his return from the magnificent Alpine climate to the damp British climate.

The Site of the Sanatorium.—It should be built on dry soil, preferably of sand or rock, which does not retain moisture, and affords a quickly drying, warm soil. It should be placed on rising ground with a southern outlook, and sheltered by hills or woodland against chill, boisterous winds. Most British health resorts which have the name of treating consumption are on or near the sea coast, but the lack of protection there has caused most sanatoria to be built inland. Proximity to towns is undesirable because of impure air, to marshes because of dampness, to high roads because of dust. The site on rising ground is partly for the purpose of commanding a view, valuable for bedridden patients, partly to provide a sufficient fall for waste water and sewage. At the same time a site some way up the side of a hill is less exposed than the top, and drier than the base. The outlook to the south is for providing shelter, and a SSE. aspect is generally best for a large block.

The grounds of the sanatorium must be such as to afford facilities of exercise. At certain stages of phthisis absolute rest is necessary, but later graduated exercise may be taken, and for this walks with frequent seats and posts marking distances, and varying gentle slopes, are required.

Sanatoria are built on two main types—the châlet or cottage type, and the hospital or hotel type. In the first type the patients live in separate cottages, one or a few in each cottage. The advantage of this is that life there is more like life in a village, which is the healthiest place for a convalescent patient. But there are many practical difficulties in the working of the system, compared with the working of the hotel type, the chief being the larger nursing staff which is necessitated. The hospital or hotel sanatorium consists of a single building, and its advantages lie in the ease of supervision in heating, and in food distribution. Its inevitable noisiness and its inevitable stairs are its main disadvantages.

Most hospital sanatoria are built with the bedrooms in a single line, the building having either a straight front or a front concave or at an obtuse angle. As a rule they are not more than two or three stories in height.

The bedrooms are single, but may be large enough to contain two to four patients. The ventilation by windows and chimneys or ventilating shafts is very complete, for example, as much as 18,000 cubic feet of air being provided per hour in Manchester Consumption Hospital, the physiological ideal being only 3000 cubic feet per hour. The floor area of the bedroom is at a minimum 120 square feet, which is enough considering that the patient spends the greater part of his day outside. Of more importance than the size of the room is the position of the ventilating openings. Cross ventilation must be secured, and hence the arrangement of the bedrooms in a single row with an airy corridor behind, so that the windows are opposite the bedroom doors, and if there is no ventilating opening on the inner wall, the door is kept open. This is perfectly safe if the bed is in a sheltered position out of the draught.

The value of verandahs is that patients may be in the fresh air, and yet be protected from both rain and sun. In this country they should not be situated on the south side of bedrooms lest they keep out air or sunlight, and more advantageously may occupy the front of a vestibule or the end of a block. Where there is a wide verandah facing the south attached to a bedroom, the patient should sleep there, using the room merely to dress in. Northern and easterly verandahs are of service for accommodating feverish patients in hot weather. To the tiled terrace in front of the ground floor bedrooms, beds can be brought on quiet mild days. Covered shelters or *Liegehallen* are found in all Continental sanatoria at least, and are very useful.

Heating is carried out either by hot-water pipes or by low-pressure steam pipes, or fires, which last method is the most expensive.

Natural light is obtained by the maximum of window space; artificial lighting should be electric, which produces the least impurity in the air.

The internal architecture, the decorating and furnishing of the building are all designed to prevent the gathering of dust. Corners are rounded, ceilings, walls, and floors are all washable; ornamental rather than useful articles, such as curtains, carpets, pictures, are excluded. Floors are made of narrowed waxed planks, often of teak, grooved and tongued. In corridors and bathrooms the floors may be of cement or some kindred substance, or tiled. The consequent noise is deadened by strips of carpet, linoleum, cork carpet, or by the wearing of felt slippers. There should be no skirtings on rooms, or in corridors, or on stairs. The stairs should consist of solid steps.

The furniture is light, and without any unessential stuffing or ornamentation, though leather-covered, stuffed furniture is not objectionable. But chairs and couches of wood or iron are best, made comfortable with cushions with washable covers.

The bedsteads are of plain iron, and the bedding should have double covers which can be washed.

Cupboards or wardrobes are necessary to keep clothes in, and cupboards are preferable as they occupy less space. They require to be as carefully constructed as the rest of the bedroom, and as carefully cleaned every day.

Washstands are generally of iron with, perhaps, marble tops. But in the sanatoria which cater for poorer patients, there are no special bedroom conveniences for ablutions, which are performed in lavatories and bathrooms. For there are sanatoria for rich and poor. The distinguishing features about those for the poorer classes are the plainer fare, the occupation of the bedrooms by more than one patient, and the less luxurious surroundings. Also the patients are expected to do some of the lighter work of the institution if they are fit for it.

Financially it is found suitable to have large sanatoria, as the cost per person is much less with a large number of patients. Thirty to forty patients are sufficient for one medical officer, and eight to ten patients for each nurse.

The treatment in sanatoria consists of a scrupulous regulation of the patient's daily life in all hygienic matters, with a special regard first towards the progress of his disease, and secondly towards training him to an open-air existence. His exercise, diet, occupations, recreations, are all supervised and controlled with a view to these two factors. But the keystone of the treatment is the existence out-of-doors. Fresh air is the great restorative to health, just as lack of it is the great inducing cause of phthisis. And this open-air régime may be carried out in *any* climate in which ordinary non-phthisical people maintain a healthy life, provided that the patient is adequately guarded against heavy rain, against high winds, and against extremes of temperature.

Shelter from rain (and snow) will appear a simple necessity, but at Nordrach Sanatorium in Kincardineshire no account is taken of rain. Even when the patient's clothes are wet, he is not required to change, provided his underclothing is dry, and even if drenched to the skin, the patient is often only covered with a thick rug, and is permitted to dry slowly. Still such a course is plainly suited only for those with good powers of reaction, and as dampness intensifies the effect of cold—as well as of heat—the patient is generally protected from rain either by verandahs or some other structure or more simply by an umbrella and rug—ample for the average showery day in Britain.

Wind is very undesirable for its dust-stirring powers, its tendency to increase coughing and shortness of breath. Also it intensifies any existing chilliness. Against it movable screens are provided on the verandahs, and summer-houses on a rotating base, which are turned about according to the wind's direction.

Cold, commensurate with the patient's power of reaction, is useful, provided there is no wind. But the patient ought to be well wrapped up and have his feet off the ground. And at the German sanatorium at Fulkenstein patients have remained out of doors in snowstorms, in dense mist, and even during relatively severe frost. Cold is easily warded off by thick clothing and warm bottles, and verandahs are often fitted in this country with hot pipes. Also body heat is better maintained when the patient is lying down, owing to the diminished demand on the heart.

Heat in excess is apt to raise the temperature in consumptives who have such a natural liability to feverishness, and also diminishes the appetite. Sun-boxes, summer-houses, trees, and verandahs are provided to ward off the sun's rays. At Hohenhonnef Sanatorium on the Rhine the verandahs can be cooled by streams of water on the roof.

When beginning sanatorium treatment, unless the weather is very favourable the patient, as a rule, requires some time to accustom himself to the open-air life, and is, therefore, exposed at first for a short time, gradually increasing, until he can remain out in the most chilly and tempestuous weather. Acclimatisation in some German institutions is sought by a course of baths, so that the skin becomes trained to react to changes in temperature. Patients are rubbed first with a dry sheet, then with spirit, next with water and spirit. At the next stage the patient is rubbed with a wet sheet, and so on until he may be "cold-sponged and cold-douched." But the cold douche has only a limited use, because of its liability to induce depression rather than stimulation.

The patient is clothed warmly, but is not burdened with clothes, excessive clothing tending to induce perspiration and chills. Woollen underclothing is generally advised for its absorbent qualities, but some people find it too irritating to the skin. Mackintoshes prevent evaporation and may be prohibited. The patient frequently goes hatless, and wears his overcoat when sitting or lying, rather than while he is taking exercise.

His exercise and his resting are also under direct medical control. If the patient is swiftly losing weight, or if he is suffering from intractable indigestion or marked anæmia, or if he is, or has just stopped, spitting blood, or if he is feverish, he must be confined to bed, getting, however, as much fresh air as he can. Pre-eminently is this necessary in case of fever. But as his symptoms abate—the temperature for instance being raised only for a portion of the day—the patient may be allowed to get up and lie on a couch or reclining chair in the open. When there are no such indications for confinement to bed, exercise is very beneficial. This in the most severe cases may take the form of passive and active, and resisted movements, combined with gentle massage, under the direction of the doctor or a masseur. From this the patient will advance to walking exercises, his walks being at first very short, and in time becoming longer and even uphill. His pace, however, always remains slow, two miles per hour being quite sufficient, breathlessness, fatigue, perspiration, rapidity of the pulse, all being avoided as indications of excessive exercise. Rest before and after meals is regularly enjoined.

At the Colorado Sanatorium in the United States Swedish movements are given to convalescents, and many other authorities recommend these or other chest exercises, when the tuberculous process can be shown to have subsided. But this is not unattended with danger, and requires the supervision of a physician.

Outdoor games and recreations are permitted provided they are mild enough—croquet, golf in the shape of putting, gentle cycling on the level, and drives, and in Alpine sanatoria, sledging. But walking is the best and most easily available exercise. Such sports as tennis, skating, and golf in its full vigour are taboo.

And such other occupations and amusements as can be carried on out of doors are freely utilised—reading, music, photography, amateur theatricals, botany, &c., only such sedentary occupations as might cramp the chest being forbidden.

The consumptive's diet is made up of the ordinary articles of food, with the difference that special measures have to be directed to meeting the emaciation characteristic of the disease. Hence milk, and cream, and butter are employed in generous proportions, the milk given being first generally sterilised. Fruit and vegetables will figure in the menu largely to avoid the use of aperients. The number of meals varies very much with the ideas of the physician in charge, and the prevailing habits in each country. Some physicians have employed feeding of consumptives with special concentrated foods, and have obtained excellent results. Special diets for fever, indigestion, diarrhœa, &c., will of course have to be arranged. The fastidious appetite of the consumptive creates problems best solved by judicious humoring and good cooking.

Suitable arrangements must be made to prevent the spread of the disease. Principally these precautions concern themselves with the disposal of the infected sputum, and in most sanatoria small spitting-flasks are carried by the patients. These are of such construction that they fit the pocket, and can be readily cleaned and disinfected by boiling. Spittoons are also provided in the sanatorium for indoor use. Paper linings in spittoons are sometimes employed, for after use they can be burnt.

In place of handkerchiefs and serviettes, squares of Japanese paper are best substituted for the same reason, and if paper is repellent to some patients, butter muslin can be utilised. In some sanatoria ordinary handkerchiefs and serviettes are permitted, but they cannot be kept long and have to be steam cleaned, and indeed are best destroyed after use.

Linen used by a patient should be steam disinfected, and his table utensils should be cleaned with boiling water or steam and dried in a hot-air steriliser. Rooms and corridors are cleaned daily with damp cloths which are later burnt, and periodically undergo disinfection chemically. A patient's bedding must be disinfected by steam when he leaves the sanatorium.

The average day of a patient leading the sanatorium life is roughly as follows. First thing in the morning is the taking of the temperature, and then he has breakfast about eight. The morning he passes in exercise and rest in accordance with the instructions of the doctor. Shortly before twelve his pulse rate and temperature are taken, and then he rests for an hour. Lunch is about one, and is a substantial three-course meal. Rest and exercise as before, in the afternoon, varied with recreation and afternoon tea, his temperature being taken after the last exercise, and then an hour's rest before dinner at seven, another substantial meal. The evening is put in with rest or a saunter out of doors, reading or other recreation, and the patient goes to bed about half-past nine.

As for the results of sanatorium treatment, it is found that a fourth or even a third of the patients are practically cured, and if one considers only the early cases the proportion of cures is very much larger. A half to two-thirds of the early cases can be quite cured by systematic treatment, if a reasonable period of time is permitted. For later cases the statistics are much lower, and very often such cases can only expect improvement and not cure.

There are now sanatoria in almost all the civilised countries of the world, and not for the rich only, but also for patients of the poorer classes. What are still required are country colonies for consumptives who have recovered, for there is much danger that these patients will relapse later on, when they return to their lives in the unsatisfactory environment in which they contracted the disease.

Open-air Treatment of Consumption at Home.—A very great part of this sanatorium treatment can often be satisfactorily carried out at home. Where the patient's circumstances admit of it, he can lie out in the open-air in gardens attached to houses, or on balconies, suitable shelters being arranged against intemperate weather. He can remain outside some six or eight hours in winter, and eleven or twelve in summer. When the patient is indoors, the windows must be kept open as far as possible, both night and day. In fact only in the most blustering wet weather should the windows be closed.

Any overcrowding in the house will, of course, practically render home treatment out of the question, because of the consequent deficient ventilation and risk of infection. Consumptives ought, therefore, to sleep alone, the bedroom being cool and freely ventilated.

A very important matter in this home treatment is the prevention of infection from the cough or spit. Hence the patient must avoid "open-mouthed" coughing, and for the disposal of the sputum should carry a "spit-bottle" containing some disinfectant, and capable of being readily and thoroughly cleansed.

It is always to be remembered that consumption can be most easily acquired, and progresses most rapidly where the patient lives in insanitary surroundings, especially in the absence of fresh air and sunlight.

Electrical Treatment.—The use of electricity in medicine is no new thing. Faradism and galvanism have played an important part in treatment for the last fifty years, and the employment of static or frictional electricity is older still. And these three forms, with the addition of such modifications as sinusoidal and high-frequency currents, are the forms now in vogue.

In dealing with the rôle of electricity in therapeutics it is impossible to enter either into detailed descriptions of the apparatus or into any exposition of the physics of the subject. These will be more fitly sought in text-books on electricity. It will be sufficient here to indicate roughly the apparatus, mentioning any appliances especially medical, and to touch on such technicalities alone as it is necessary to include.

I. Faradic Treatment.—The essential apparatus for the production of the faradic current consists of a small battery containing one or two cells, and an induction coil. The current may either be given so as to produce a general stimulation, the electric bath being then used, or it may be applied to different parts of the body.

The *general* stimulating effect of faradism is employed in all forms of ill-health, in the weakness following severe illnesses, such as influenza, enteric fever, "blood-poisoning," &c., or in the weakness and malnutrition accompanying such diseases as anæmia, rickets, or in a debased physical state associated with nerve exhaustion—neurasthenia. For treatment the patient is placed in a warm, deep bath. One large flat electrode is put behind his back, the other at his feet. The current is permitted to pass, at first slowly, and then with increasing strength, until the patient feels a tingling in his toes. The patient is subjected to this treatment for about a quarter of an hour. The general effect is at once tonic and soothing.

The following are cases where the faradic current is applied locally:

1. In various conditions arising in hysteria, of which the following may be mentioned:

(*a*) In catalepsy, where the limbs remain in any position in which they are put for a considerable time, a strong faradic current may be employed. The skin is moistened in order to decrease its resistance to the current. One electrode may be placed at the back, the other consists of an instrument like a paint brush, the bristles being of wire, and is known as a "wire brush." With this "wire brush" the skin is stippled, not lightly brushed.

Similar treatment is often efficacious in hysterical contractions, where a joint is continuously kept in a bent position.

(*b*) Hyperæsthesia, or excessive sensitiveness of the skin, may often be banished by rubbing with an electrode provided with a species of roller, a slight current being passed at first and later increased.

(*c*) Aphonia or loss of voice arising from hysterical weakness of the vocal cords is best treated by intra-laryngeal faradism. The laryngeal electrode consists of a stiff wire, curved sharply almost to 90° at a point two inches from its end, and having a small knob at the end. This electrode is pressed into the throat, so that the knob comes to lie in the windpipe between the vocal cords. The other electrode is applied over the skin of the throat. A short application of a moderate current is usually at once curative.

(*d*) Hysterical convulsions can be readily stopped by the application of faradism. One electrode is applied to the back, and the other, which is small, is applied in rapid succession to different parts of the trunk and limbs. A fairly strong current is used, producing moderately strong contractions of the muscles.

As a matter of fact the efficacy of faradism in hysteria depends to a very large extent on the mental effect it produces.

2. Sciatica. The pain of sciatica in its late stages, when any acute inflammation in the nerve has subsided, can be made to disappear under a short series of faradic applications. One electrode is applied to the calf, the other—a roller electrode—is rubbed along the course of the nerve in the thigh and buttock. The current should be of sufficient strength to produce muscular contraction, but no pain.

3. The use of the roller electrode in lumbago will frequently banish the stiffness and pain incident in that condition.

4. The condition known as Convulsive Tic can generally be controlled by faradism. Tic is an act such as might be produced purposely, but really produced spasmodically and involuntarily; for instance, nodding of the head, twitching of the corners of the mouth, the most familiar instance being "life" in the eye, which is one kind of "blepharospasm." This blepharospasm can be averted by the application of the electrodes, one over each eyelid, a weak current being used. And the other forms of convulsive tic can be similarly treated.

5. Headache associated with fatigue and nervous exhaustion can be often miraculously relieved by five minutes' treatment with a weak current. The electrodes can be placed either at the root of the nose and at the back of the head respectively, or one on each side temple. This is of especial efficacy when the headache is referred to the forehead, but is useless when the pain is throbbing in character. A second application ten minutes later may be given if the first has not been entirely successful. Where the pain is located on the top of the head, one electrode may be applied there, the other being situated at the nape of the neck.

6. In the anæsthesia, *i.e.* loss of sensation, which occurs after an apoplectic seizure, as well as in similar conditions consequent on various kinds of "schlerosis" in the spinal cord, *i.e.* the growth of the fibrous supporting tissue at the expense of genuine nerve cells and fibres, improvement at least can be obtained by faradic application. The wire brush or the roller electrode is applied over the affected area, the other electrode being placed over the spine.

7. In coma, that state of powerlessness and unconsciousness indicating a failure of the brain, faradism is often used as a restorative; particularly in opium poisoning, where it is essential to ward off even the onset of coma. In this case one electrode is applied to the spine, the other, which may be the wire brush or an ordinary small electrode, is applied to different points in the limbs and trunk. A fairly strong current is used, producing active contractions in the muscles, and providing a vigorous excitation of the sensory nerves. This method of treatment is superior to the older more barbarous habit of hitting the patient with towels, walking him up and down, &c., and it has the notable advantage of not wearying out relays of attendants.

8. In syncope or heart failure occurring during the administration of chloroform or other general anæsthetic. One electrode is placed over the heart or at the foot of the breast bone, the other is placed at the root of the neck, a little to the side and above the collar bone. A similar procedure is tried also in failure of breathing. But neither method is by any means certain.

9. In dilatation of the stomach through loss of tone in its musculature induced by low state of health as in anæmia or tuberculosis, or by some local cause, such as long-continued indigestion, and injudicious dieting. In this case one electrode is applied to the skin over the stomach, the skin being moistened, the other is introduced into the stomach, and is in the form of an insulated copper wire—the copper being exposed at the end—passed down through a rubber stomach tube. A current strong enough to give weak contraction of the superficial muscles is then permitted to pass for not more than a quarter of an hour. The patient is given a quantity of fluid to drink beforehand, so that the internal electrode is not in contact with the mucous lining of the stomach, and no pain and little discomfort is occasioned. Treatment is given on alternate days for about three weeks. The stomach muscle is much braced up by this treatment, and there is a marked improvement in digestion.

10. Constipation due to lack of tone of the large intestine can be treated in like manner. For this a special electrode is introduced some three inches into the anal passage. This electrode is made of strong wire and has a metal bulb at the end. The other, a roller electrode, is moved over the abdomen, following the line of the large intestine. That is, beginning at the lower right-hand quadrant of the abdomen it is brought up the right side, across the upper part just below the ribs, and down to the lower left-hand quadrant. The immediate result is to engender a desire to go to stool, and the treatment is most suitably given in the morning a short time after breakfast. Such applications, lasting for about a quarter of an hour, are given daily or every second day according to the requirements of the case, and are continued from one to two months.

11. Prolapse of the rectum, *i.e.* protrusion of the

bowel at the anus, and prolapse of the uterus can be treated in the same way.

12. Enteroptosis, where all the abdominal organs tend to gravitate to a lower level in the abdomen through a weakening of their supporting ligaments and deficiency in tone of the gastric and intestinal musculature, is treated by a combination of the methods described for the relief of gastric dilatation and constipation. The current is first passed for ten minutes with one electrode in the stomach, the other being applied to the abdominal wall, and then after a short interval there is a second application, the rectal electrode being used in place of that in the stomach.

13. Faradism is often utilised with massage to keep up the nutrition of muscles whose nerve supply is, as it were, temporarily disorganised, though not destroyed by injury or disease. The muscle is made to contract by placing one electrode over the main nerve from which the branch of supply springs, and the other over the muscle. If the muscle is stroked, a point will be discovered at which the application of the electrode produces the maximum amount of contraction. This is known as the "motor point" of the muscle, and its position varies only very slightly in different individuals. These "motor points" are made use of mostly in diagnosis by means of electricity, for remediable or irremediable degeneration in a muscle or its nerve supply can be diagnosed by suitable tests with the faradic and galvanic currents.

14. Attempts have been made to cure exophthalmic goitre by means of faradisation. The features of this malady are swelling of the thyroid gland in front of the neck, a rapid heart rate, and protrusion of the eyeballs, accompanied by a considerable degree of emotional disturbance. For all three conditions faradisation has been tried. The swelling in the neck has been treated with weak currents, one electrode being placed over it, the other over the spine at the back of the neck. Similarly for the heart and eyeballs. The eyes are treated with one electrode at the back of the neck, the other being passed round about each eye in turn, the current being of such strength as to cause contraction of the eyelid muscles. Some physicians have commended this treatment highly.

Faradism is very often combined with galvanism in medicine. This combined treatment will be described later.

II. Galvanic Treatment.—The essential apparatus for the production of the galvanic current consists of a battery or dynamo or accumulators from which the current can be obtained, a galvanometer to estimate the current, wires and electrodes. And as in the case of faradism, galvanism can be employed to produce a general or a localised stimulation. The galvanic current, however, differs from the faradic in its effects, for its electrolytic action produces chemical changes in the tissues. This electrolytic property makes it of use in treating various superficial conditions by actual electrolysis of the tissue elements, and also in the introduction of drugs into superficial parts, a process known as cataphoresis or ionic medication.

A. But to consider first its uses apart from actual electrolysis—the general stimulation from galvanism is best produced by means of baths. The patient is immersed in a bath at 100° Fahrenheit. The positive electrode, covered with some material to prevent injury to the skin, is situated behind the patient's back. The negative electrode, which is as a rule without covering, being in contact only with the thicker skin of the sole, is at the foot of the bath. A strong current is passed—130 milliamperes or more, for only a fraction of the current traverses the patient's body—this fraction being variously estimated at one-tenth to one-third, the remainder of the current passing merely from pole to pole through the water. The patient remains in the bath from ten to fifteen minutes, the time increasing as he becomes accustomed to the treatment. Due precautions have to be taken to prevent the patient being given an unpleasant electric shock.

Or this hydro-electric treatment may be given by means of the Schnée or four-cell bath. This consists of four small porcelain baths, one for each arm and leg. The arm-baths can accommodate the arm up to the elbow, the leg-baths can accommodate the leg up to the knee. In each "cell" is placed an electrode connected up with a central switchboard, the arm-baths being connected with one pole, the leg-baths with the other. The baths contain hot water to which some drug in solution may or may not be added, and they are so arranged about the patient that he can sit comfortably on a chair while his arms and legs are under water. Seeing that all the current passes through the patient's body, a much weaker current is used—five to twenty-five milliamperes. The advantages of this Schnée bath are firstly that the patient need not take a full bath, only the arms from the elbow and the legs from the knee being immersed, and secondly the ease with which one or two of the "cells" may be utilised for treating localised affections in one or other limb.

Hydro-electricity with the galvanic current is directed to much the same conditions as the faradic bath treatment—the general debility of convalescence, of anæmia, &c. But also in this general application it is useful in decreasing the pain of a neuritis or soothing the aching discomfort of lumbago and chronic muscular rheumatism.

Galvanism is much more frequently employed to treat local conditions; its principal uses being to keep up the condition of muscles which are tending to atrophy—usually as a result of some interference with their nerve supply, and to produce various effects in diseased conditions of nerves.

The following are some of the main conditions in which it is used:

1. In acute anterior poliomyelitis or infantile paralysis, a disease attacking nerve cells in the spinal cord, with consequent paralysis of the muscles dependent on these cells for their nervous control. Very often there is a large measure of recovery, but while the control of the nerve cells is in abeyance, the vitality of the muscle is kept up by daily massage and galvanic treatment. For this latter the positive electrode is placed over the spine, and each muscle in turn is stroked with the negative electrode, which is lifted off the skin at the end of each stroke. It is absolutely essential that the electrodes be kept moist in order to prevent any injury to the skin, and chamois leather, flannel, or cotton-wool, or some other absorbent material is always wrapped round the metal electrode. The treatment is continued for many months.

2. In the same fashion muscles may be maintained in good condition in cases where their nerves have been cut across or otherwise put out of action, pending the re-growth of the disabled nerve, or its return to normal activity. Instances are injuries in accidents to the nerves supplying the arm muscles, of which the commoner forms are pressure on the "musculo spiral" nerve in the upper arm, producing drop-wrist, where the hand cannot be straightened, but hangs bent at the wrist, and a cut on the front of the wrist severing the "ulnar" nerve, and producing a curious paralytic state in the small muscles of the hand. In the lower limb the "external popliteal" nerve, which winds round the bone on the outer side of the leg just below the knee, is especially liable to injury, which produces a "drop-foot" paralysis, analogous to wrist-drop. The patient then walks with a peculiar high-stepping gait in order to lift the half-paralysed foot clear of the ground.

Inflammation in nerves or "neuritis" can produce similar paralytic phenomena calling for similar treatment. One of the most striking instances of a paralysis caused by a neuritis is the facial paralysis following on a neuritis in the facial nerve, often following exposure to chill or draughts. In this paralysis the active muscles on the unparalysed side draw the face to their own side with disastrous results to the good looks of the patient. The galvanic current is applied by two small electrodes, the negative placed underneath the ear, the positive being passed over the face following the directions of the different muscles. Applications are given daily for about a quarter of an hour, with a weak current. Cure may be rapid or may be delayed over some months. In any case the galvanic current, as a rule, produces a state of permanent contraction in the muscles, so that, even if their power is not restored, the nerve not regaining its functions, the deforming asymmetry of the face is usually abolished.

Neuritis can produce similar paralysis in the limbs also.

Where a whole limb is to be treated for paralysis, galvanism can often more conveniently be applied in one of three ways. One is to use the Schnée cells, another is to use a reversing galvanic current, the third is to combine galvanism and faradism. One Schnée cell is employed by having the electrodes at the extremities of the part treated—for instance, in the arm-bath, one electrode and the kathode is placed at the fingers, the anode being at the elbow. Or if two limbs are to be treated the anode is put in one bath and the kathode in the other. In using reversals of the galvanic current the electrodes are also put at the extremities of the limb to be treated, and a mechanical reverser is used to reverse the current at intervals of one second, so that for one second the current passes say from knee to toes, and for the following second from toes to knee. By this means regular exercising contractions can be induced in the muscles.

If the muscle still retains its property of contracting under faradic stimulation, faradism and galvanism can be given together. The faradic current is used with slow interruptions, two or three a second, and a weak current only sufficient to produce twitching in the muscles. A galvanic current is then added, and it is found that this addition makes the contractions produced by the faradic current much stronger. This combination is more efficacious than either current singly. The galvanic current is employed sometimes with reversals every second, sometimes continuously in one direction. The electrodes are placed either at the extremities of the part to be treated, or one remains at one extremity and the other is employed to stroke the muscles systematically.

3. But in addition to this power of stimulating and keeping up nutrition, the galvanic current has a very valuable faculty of diminishing pain in nerves, either arising from a neuritis or inflammation of the nerve, or in the neuralgias of other origins. It is found that the positive electrode has the greater sedative power, and this power is utilised in the treatment of trigeminal neuralgia where the pain affects the nerves of the face and front of the head. In trigeminal neuralgia there are, as a rule, certain especially painful spots corresponding to the points of emergence of the sensory nerve twigs on the face, pressure on any one of these spots exciting a spasm of pain. To these spots a small round anode is successively applied, the negative pole being placed at the back of the neck, and a weak current is passed. This is not too certain a remedy, however.

Much more reliable is the employment of galvanism in sciatica. Applications of the current, of half an hour's duration, are given twice a day, and are one of the best methods of checking the great pain of this disease, and the current is further credited with controlling and diminishing the inflammation in the nerve. One smaller electrode, generally the anode, is placed in the middle of the buttock, the patient, who is in bed, lying on it. The kathode, which is larger and concave in shape, is applied to the lower part of the thigh just above the knee. The current is turned on slowly, and gradually increased until a strength of twenty-five milliamperes is reached. At first the patient finds the stinging of the current very trying, but shortly this passes off. The current at the end of the application is as gradually decreased and turned off as it was begun. The relief of the sciatic pain is generally achieved at once.

Neuritis in the arm can be similarly relieved.

4. Tinnitus or ringing in the ear with deafness can sometimes be dispelled by galvanic treatment. One electrode—the negative—is placed over the long projection found below and behind the ear, and known as the mastoid process. The ear is filled with water, and a "laryngeal" electrode consisting of a stiff wire ending in a small knob is placed in the water. For fifteen minutes a small current is passed, being gradually turned on and off. A faradic current with slow interruptions can be combined with the galvanic current. Others, using the galvanic current only, place the kathode in the ear, and the anode over the back, and pass strong currents for twelve to fifteen minutes three times per week.

5. Galvanism can also be invoked for the relief of spasms and cramps of various kinds. One of these is the rare condition known as Raynaud's Disease, where there is supposed to occur a spasm of the small arteries producing a state of defective nutrition in the tissues supplied by these arteries, which may go on even to gangrene of the part. It

occurs in the limbs and is accordingly suitably treated by the Schnée-cell method. Applications for about twenty minutes are given daily.

Chilblains are held also to be due to a change in the arterioles, and in the early stages have been successfully treated in the same manner. Faradic currents have advantageously been combined with the galvanic in this case.

Spasmodic wryneck, where a series of spasmodic contractions of certain muscles produce jerkings of the head to one side—generally the left—can be treated by applying the anode over the muscle affected, as a rule the large "sternomastoid" muscle running from the breast bone up to the bony prominence below the ear, the kathode being placed at the back of the neck. Daily applications are given of about twenty minutes' duration.

The "professional spasms" or "occupation neuroses"—where "long-continued excessive use of the muscles in performing a certain movement may be followed by an irregular, involuntary spasm or cramp, which may completely check the performance of the action"—can be treated by galvanism. It is commonest in the small muscles of the hand, and its best-known form is "writer's cramp," but "telegraphist's cramp," "piano-player's," "violinist's," "cigarette roller's cramp," are other definite instances. In such cases galvanism is best applied in the form of the arm-bath.

6. Exophthalmic goitre has been subjected to galvanic treatment, the method adopted being to place the anode over the back of the neck, the kathode over the swelling at the front of the neck. The results have not been impressive, though diminution in the symptoms has been reported in some cases.

7. Enlargement of the spleen in splenomedullary or myelogenous leukæmia, where there are marked changes in the spleen and bone marrow and changes in the blood cells, and enlargement of the spleen in Bauti's Disease, an anæmia associated with splenic overgrowth, are treated by galvanisation, one electrode being placed over the spleen on the front aspect of the body, the other at the back. Applications are given daily, and considerable lessening in the size of the spleen has been observed.

B. **Electrolytic Treatment.**—In this method of treatment electricity is employed to decompose the blood and tissues of a part into their chemical constituents, with the result that at the positive pole oxygen and acids appear, while at the negative pole hydrogen and bases appear, or in other words caustic acid are found at the anode, caustic alkalies at the kathode, so that at each pole a cauterisation, or searing of the tissues is produced by the action of these chemical substances, acid or alkali. Hence electrolysis is used in several conditions to get rid of undesired tissues. The following are its chief uses:

1. In *angiomata* of the skin or nævi, tumours composed of small blood-vessels, varying in size from small "spider" angiomata to large port-wine birthmarks, there are two methods to choose from, the unipolar and the bipolar method.

In the unipolar method, the positive electrode is applied to the back of the neck, the negative electrode consists of one or more metal needles according to the size of the nævus. The needles are thrust into the nævus, and a current of the strength of ten milliamperes is allowed to flow until there is definite consolidation in the tissues being treated. For the small nævi a weaker current and shorter applications are sufficient, and "spider" nævi (where there is a dilatation of small vessels on the face resembling a spider's web) and dilated venules, also most common on the face, are best treated by the unipolar method with a single needle. The process is very painful, and where several applications are to be given at one sitting, an anæsthetic is necessary. The electrolysis dispels the nævus or venule, but it is often a week before the subsequent swelling and discomfort subside.

In the bipolar method both poles are introduced into the nævus. The electrodes again take the form of needles made of platinum, or of steel insulated with vulcanite to within an eighth of an inch of the points. The needles are sterilised, and inserted at about half an inch distance from each other. A current of some twenty to eighty milliamperes is slowly turned on, when the tissues, especially round the positive pole, become hardened. The negative pole is moved from place to place, so as to produce several tracks of cauterisation. The duration of the sitting is estimated by the solidifying effect produced in the tumour, and lasts for about a quarter of an hour, about two months elapsing before a second sitting is given. In a large nævus as many as eight sittings may be necessary altogether. Several needles may be used at the poles as in the unipolar method.

2. In the treatment of *aneurisms* electrolysis has been utilised. An aneurism is a sac communicating with an artery and containing blood either in the fluid state or as clot. The needle electrodes insulated save at the tip are passed through the tissues overlying the aneurism, and through the outer wall of the sac, and are made to touch the opposite wall, the pulsation in the sac causing the top to move over the wall, scratching it slightly. A current is passed as through the nævus, and coagulation of the blood in the sac is often caused, with curing of or at least relief from the aneurism.

Another method is to introduce into the sac through a hollow needle thrust into its wall ten to twenty feet of fine silver wire, which coils up in an open meshwork inside the sac. This wire is connected up with the positive pole, becoming an anode, while the negative electrode is placed over the patient's back. A current of twenty to fifty milliamperes is allowed to pass for an hour, when considerable clotting takes place about the wire. This is known as the Moore-Corradi method.

3. Hypertrichosis, the growth of hair in abnormal sites, can be cured by electrolysis provided that the "superfluous hairs" are not too numerous, when the X-ray treatment might be preferred. The positive electrode is applied to some indifferent part of the patient's body, the wrist, or the patient may hold a handle in the hand connected with the positive pole of the battery, or may have the fingers dipping in a basin of water in which the positive electrode is placed. The negative needle electrode is thrust as nearly as possible into the hair follicle at the root of the hair, penetrating about one-eighth of an inch. It is held there for a few seconds, while a current of one to four or five milliamperes

is passed, white froth of hydrogen gas appearing the while. One should then be able to pull out the hair easily. It is a painful process, and therefore the number of hairs which can be removed at a sitting depends on the endurance of the patient.

4. Small moles can be caused to disappear by electrolytic treatment. The two needle electrodes are pushed into the mole from opposite sides, and a current of three to eight milliamperes passed for about ten seconds.

5. Among other palliative measures employed in treating fibroids of the uterus is electrolysis. In this condition tumours composed of muscular and fibrous tissue grow in connection with the uterine wall, the principal symptom being hæmorrhage. When an operation is not undertaken, the bleeding can be stopped in many cases, and sometimes even the tumour diminished in size by electrolysis. The positive pole is introduced into the uterine cavity, the kathode is applied to the front of the abdomen, and a strong current is passed for five minutes. Treatment is given every other day. The patient rests for half an hour after treatment.

C. **Ionic Medication or Cataphoresis.**—By this is meant the introduction of drugs through the surface of the body by means of electrolysis, and it is best explained by a brief reference to the principles underlying this latest therapeutic use of electricity. A compress of absorbent material soaked in a solution of a drug is placed over the area to be treated—the treatment is employed almost entirely for localised diseases—and to this compress is connected one pole of an electric battery. The other pole is applied to some other part of the body, and a current is passed between the poles. The effect of this current on the solution of the drug is to break it up into its component radicals or "ions"—sodium chloride or common salt, for instance, being broken up into sodium and chlorine. One ion passes to the positive pole or anode, and this is called the anion, the anion of salt being chlorine; the other ion, or kation, passes to the negative pole or kathode, the kation of salt being sodium. Hence when the kathode is applied to a compress of a salt solution over a diseased part, and the anode is applied to another part, the current will break up the salt, the kation, sodium, remaining at the kathode, but the anion, chlorine, passing into the body on its way to the positive pole. Unless, however, a very intense current is applied over a long period, this ion will not reach its pole. After the ion—or medicinal substance—has penetrated to the desired depth, the current is stopped, and the medicinal substance is deposited. In this fashion the tissues in any part can be impregnated with drugs, a concentration unattainable by any other method.

The apparatus consists of a constant-current battery or other source of electric power giving a voltage up to sixty, appliances for regulating and measuring the amount of current, and electrodes of size suitable to fit the area to be treated, which can be roughly moulded to the part. The compress is made of thick clean absorbent material of one sort or another, moderately saturated with the solution of the drug. The electrode is firmly bandaged over the compress.

Uses.—The effects following the introduction of drugs in this manner may be general, but are most often localised. For to produce general effects drugs may be given as readily by the mouth or injected hypodermically.

All the possibilities of local treatment are not yet defined, but the following are the chief uses so far:

1. In deadening pain in neuralgias, notably in the exceedingly painful and often chronic "trigeminal neuralgia" where the nerves of the face and front part of the head are involved. Various drugs may be used. A compress soaked in a 2 per cent. solution of sodium salicylate at the kathode may be applied for a half to three-quarters of an hour three times a week. Pain is rapidly relieved and complete cure is often secured at once, though in other cases as much as six weeks' treatment is required. Instead of salicylic acid a solution of an alkaloid, morphine, cocaine, aconite, or quinine has been employed, the compress in these circumstances being at the anode.

Sciatica has been treated successfully by salicylic ionisation, the negative electrode being applied over the buttock with the sodium salicylate solution there, the other pole being at the lower part of the thigh just above the knee. Similarly one may attack neuritis of the nerves of the arms.

To produce analgesia or insensibility of the skin to pain before some small but painful operative procedure ionisation with cocaine has been tried.

2. In disinfecting inflamed wounds and abscesses, and to induce healing. The wound is covered with a thick layer of dressing soaked in aseptic sodium salicylate solution, and the cathode is applied. After one sitting the pain is generally relieved, and if the dressing is left undisturbed, the wound will be found on the next application to be disinfected and closing in.

In place of sodium salicylate a solution of zinc sulphate or chloride can be used, the compress being at the anode, for it is the zinc ion which produces the results, coagulating the albumen of the tissues and sealing up the small vessels, thus preventing the carriage of infection to other parts.

The zinc ion may be carried into boils, and into the pustule of anthrax by using as anode a zinc needle, thrust into the infected part. Healing can be induced in a day or two by this means—a great advance on the lancing and draining treatment commonly employed.

3. To stimulate nutrition and dispel fibrous thickenings, adhesions, &c., which may have been formed after acute or chronic inflammatory processes. Best results in this sphere have been obtained in the treatment of complete "ankylosis" or immobility of joints. A thick layer of absorbent material is wrapped round the affected joint. The drug employed is usually sodium chloride, and the kathode is placed over the compress. Chlorine is thus introduced into the affected joint, and has a powerful action in stimulating the absorption of the inflammatory products. Gradually, under daily electrolytic applications, the power of movement returns, and after three months a full range of movement may be restored to the joint. The wrist, elbow, knee, and ankle joints are more suited for this treatment than the more deeply placed shoulder and hip joints. Currents of high intensity can be used, but when daily séances are being given, the point of application of the electrodes should be constantly changed.

Other ions having similar effects are the iodine ion and the "hydroxide" ion obtained when caustic soda or sodium hydroxide is electrolysed. This hydroxide ion or OH ion is employed in stricture of the urinary passage, a metal instrument passed into the urethra acting as kathode (the chemical electrolytic reaction in this case is rather more complex). Applications with currents of medium strength are given twice a week, and good results are as a rule obtained.

4. In certain tumours of the skin, ranging from the simple wart to the malignant growth, zinc ionisation has proved effective. In the case of warts a magnesium ion has been employed.

5. In nævi or skin tumours composed of small blood-vessels, fine zinc needles or threads impregnated with a solution of a salt of zinc are introduced to act as the anode, and are said to give "infallible" cures.

6. The solubility of lithium urate has led in ionic medication to the employment at the anode of lithium chloride compresses, over gouty deposits of sodium biurate—as comparatively insoluble salt. The intention is for the deposit to be changed to lithium urate, but also uric acid is removed, and is found at the electrode.

7. More deeply situated tumours have been treated with zinc ionisation or by the introduction of radium ions. But it can hardly be called a generally accepted line of treatment. The use of radium in this connection is described under the heading of Radium. Another radio-active element, thorium, has also been more or less successfully tried in cases of tumour.

Sinusoidal Treatment.—The sinusoidal is an alternating current, not unlike faradism in its effects though smoother, and as regards its action on muscles producing less painful contractions. It is generally derived from an electric house supply, the voltage of which can be reduced by means of a special apparatus resembling the faradic apparatus, known as a transformer. Wires and electrodes are the other main essentials.

This sinusoidal current is employed to produce both general and local reactions. For *general* purposes it can replace the galvanic or faradic current in the full electric bath, or in the Schnée four-cell bath. It is utilised mainly in diseases where there are lesions of the central nervous system with a state of "spastic paralysis" of the limbs, *i.e.* a condition where there is loss of power in the limbs owing to an interference with nerve communications between the higher centres in the brain, and the lower controlling centre in the spinal cord. Such conditions are disseminated schlerosis, where in patches nervous tissue is replaced by fibrous tissue accompanied by an interference with conduction of nervous impulses, myelitis, or inflammation in the spinal cord, paraplegia, where the grey matter of the brain is involved.

And for local treatment of these same conditions the sinusoidal current is used, often in the one- or two-celled Schnée bath. The stiffness and indeed immobility of joints that often follows an apoplectic shock where one limb or the limbs of one side are in this state of spastic paralysis or "hemiplegia," can be much diminished by daily applications of the current in Schnée cells.

In paraplegia, or spastic paralysis involving both legs, the treatment is given with two leg-baths.

But, in addition, the "myopathies" or "muscular dystrophies," where there is atrophy associated with weakening of the muscles primarily, with no or only secondary involvement of the nervous system, have been treated with the sinusoid current by means of the arm- or leg-baths. While it has been found to stay the course of the disease, it is by no means accepted as anything but an adjuvant in treatment.

Occasionally a three-phase sinusoidal current is used, where three electrodes are applied. The effect of this is to give a kind of circulating current, so that if we name the electrodes A, B, and C, there is one current flowing from A to B, from B to C, and from C to A. The one important application of this three-phase current is in the treatment of atonic or relaxed conditions of the musculature of the alimentary canal. Electrodes are employed exactly in the same way, and of the same construction as are described in connection with the use of faradism in this condition. One is passed into the stomach, one is introduced into the rectum, the third is applied to the front of the abdomen.

High-frequency Currents.—For the various applications of the oscillatory discharge or high-frequency current there are necessary, in addition to the special electrical apparatus, certain medical appliances, a "condenser couch" covered with insulated cushions on which the patient lies, holding a metal handle connected with one pole of the electrical apparatus, the other pole being connected with a metal plate at the back of the couch; a "cage solenoid," a large wire cage in which the patient is placed, the primary currents circulating in the cage inducing secondary currents in the patient—"autoconduction;" electrodes much as used for static electricity, including, however, special vacuum electrodes, made of hollow glass, enclosing a vacuum, and which, when passed over the skin, attracts blue sparks from the skin to the outer surface of the glass. Inside there appears a fine glow of violet light.

The high-frequency current is employed at hydropathics and elsewhere, being credited with a general tonic action, hence its use in gout, diabetes, obesity, chronic rheumatism, and other disorders of the normal body changes.

Neuralgias sometimes benefit considerably. The treatment is often combined with massage for headaches, blue sparks being visible about the masseur's fingers as he massages the scalp.

Baldness, and some chronic skin diseases are also treated with the brush or vacuum electrode, the benefit being most likely due to the increased flow of blood to the part.

Rheumatoid arthritis has also been much improved in many cases by high-frequency treatment.

Static Electricity is used in several ways in therapeutics.

The apparatus employed is some form of generator of the electricity, *e.g.* a Leyden jar, an insulated stool on which the patient sits, his feet resting on a metal plate connected to the positive pole, and various kinds of negative electrodes.

Treatment can be given by sparks, by the "breeze," by friction, by static changing.

For the spark treatment a negative electrode ending in a round knob is employed. This is brought rapidly to within a short distance of the surface of the body, and rapidly withdrawn, when a spark leaps across the intervening space, producing a sudden contraction in the muscles at the point of contact. Large weals may be temporarily caused at such points. The suggestion effect exceeds the physical effect in this treatment, hence its employment, as of all other forms of static electricity, is mainly in hysterical manifestations.

The "breeze," which as felt is a cool wind on the skin, or as a hot pringling when the skin is covered, consists of an electrical charging of the patient, who as before sits on the insulated stool. The negative electrode has several points, and is directed towards the different parts requiring to be treated. Its chief use is the relieving of headaches and neuralgias.

Friction is where a roller electrode is used, and is passed quickly over the limbs and trunk. The clothing must be thick and dry, sparks raining through on to the skin. This produces a milder effect than the sparking with the knob electrode.

Static charging is where the patient is seated on the stool, and by the footplate is connected with one pole of a machine generating the static electricity. His potential is gradually raised, and the charge as it were oozes out of him to the surrounding air and objects by way of the hair and extremities. The hair stands on end, and the skin has a prickly sensation. This is known sometimes as the static bath.

Electric Light Treatment: Photo-therapy.—The body is exposed to electric light treatment with a view to two effects: (1) the actinic effect of the rays of light on the skin and the tissues immediately underlying it; (2) the free perspiration which it may provoke.

The actinic rays are abundantly present in the ultra-violet end of the spectrum and are found, therefore, in greatest numbers in the light from the arc lamp and mercury vapour lamp. The heat rays occur at the red end of the spectrum and are found, therefore, mostly in the light from the electric incandescent lamp.

1. The chief apparatus used in the therapeutic applications of the ultra-violet rays is the "Finsen light," the mercury vapour lamp being less frequently employed. The Finsen light is the light from a powerful arc lamp directed on to the skin through a quartz lens. Modified forms of the old apparatus are now preferred, but this is the essential idea.

The mercury vapour lamp consists of a vacuum tube containing only two or three ounces of mercury and mercury vapour, and no air, through which a current is passed, and which then diffuses a greenish-blue light, the spectrum of which is almost free from red rays. A common form in medical treatment is known as the Uviol lamp, but lamps with quartz lenses are superior, and are becoming more frequently employed.

Lupus or tuberculosis in the skin is the principal disease thus treated. The lamp is brought close enough to the person to have the quartz lens pressing on the skin and blanching it by driving out all the blood from the immediate neighbourhood. The exposure lasts for about one hour. On the next day a small blister makes its appearance at the site of application, which is dressed with some ointment and rapidly heals up. Many applications have to be given, and the process is tedious though often very effective. The mercury vapour lamp can be substituted for the Finsen light.

Chronic eczemas have sometimes responded to light- or photo-therapy. After repeated exposures the part may redden, swell slightly, become painful, and commence to heal up.

Alopecia areata, a disease of the scalp characterised by the appearance of small round bald patches, increasing in size and number, has been attacked by means of the Finsen light and Uviol lamp. And cases of recovery are recorded—the patient being exposed twice a week for an hour at the distance of about a foot from the lens.

2. Radiant heat baths to promote perspiration are generally given by means of the cabinet bath. The patient sits inside a small cabinet, which includes all parts of his body except his head. Inside the cabinet the body is subjected to the light of several incandescent electric lamps, the temperature rising from 100° F. up to 300° F. as a maximum. Profuse perspiration is produced after about five minutes, exposure, but the amount of sweating can be regulated by the number of lights used, as well as by the duration of the exposure. After a quarter of an hour in the cabinet, the patient is rubbed down with towels, and rests for some twenty minutes before putting on his clothes.

This electric bath is mostly of value where there is some poisonous substance or "toxin" circulating in the blood, originating in some diseased process, as in chronic Bright's disease, in gout, in chronic rheumatism, rheumatoid arthritis, and in some forms of neuritis or inflammation of the nerves. The aim is to get rid of these toxic products in the freely poured out sweat, since the normal excretory process is insufficient to cope with them.

Such baths must never be used by any patient suffering from a heart lesion.

Radiant heat has also been invoked in place of hot-water bottles to keep up the body warmth of patients suffering from, or threatened with shock—the condition of depression following severe injuries in which there is a great lowering of the blood pressure, and marked fall in temperature.

The patient is wrapped in hot blankets, over which a semi-cylindrical cage is placed, which itself is covered over with the outer bedcover. In the space between the blankets and the cover, incandescent electric lamps are placed, suspended from the cage. An equable heat can thus be kept up over as long a period as is necessary.

X-Ray Treatment.—When an electric current of high potential is passed through a tube from which all the air has been withdrawn, the tube is filled with a phosphorescence produced by the impact on the glass at the anode of a beam of rays issuing from the kathode. These rays are electrons or "disembodied charges of negative electricity," and in addition to this perceptible phosphorescence, they produce, by their impact on the glass, new rays, known either as X-rays or Röntgen rays.

Though imperceptible to the eye, these X-rays travel with the same velocity as that of light, and can affect sensitive photographic plates in spite of dense objects intervening. They have a high power of penetrating solid substances, but this power is modified by the density of the object, and hence their value in photographing such a mixed structure as the human body.

Their ultimate nature is not yet certainly known. They are not composed of material particles, nor are they deflected by magnets. They may be described as "pulsatile vibrations in the ether," with a very short wave-length, and the shorter the wave-length the more penetrating the ray.

Applied to the surface of the body they have a stimulating effect, but on prolonged application they may be both irritating and destructive.

Their use in medicine has been twofold: (1) in diagnosis where they are employed to photograph or shadow forth on fluorescent screens, internal organs and structures, especially bones; (2) in treatment where their penetrating and stimulating properties are utilised to combat the progress of disease.

The apparatus for X-ray work varies greatly, but essentially it is the same everywhere. It consists of a glass tube about a foot long, the middle half of the tube being dilated into a bulb.

This tube is made either of soda glass, which permits the X-rays to escape freely, or of lead glass provided with a window of soda or other non-absorbent glass. In the central bulb are two anodes, which may or may not be connected with each other outside the tube. One of these anodes is made of aluminium, and is placed towards the side of the tube. The other anode, which is made of copper coated with platinum or some other substance having an equally high or higher melting point, is situated opposite the kathode, and is known as the antikathode. It is at such a distance from the kathode that the beam of rays producing the X-rays are almost, but not quite, focussed on it. It is tilted at an angle of 45° to the axis of the kathode. Its coating of platinum or other metal is needful to resist the intense kathodal rays, and in some tubes there are air-cooling and water-cooling mechanisms to increase its resisting power. The kathode is made of aluminium, and is concave-faced, in order that its rays may be properly focussed. There is an almost complete vacuum in the tube, the pressure being reduced to one-millionth of an atmosphere. Most tubes are provided with a device for lowering the vacuum—an "osmonegulator." A tube with a high vacuum is called "hard," and that with an insufficient vacuum is called "soft"—the normal tendency being for the tube to become "hard," though under other circumstances the tube may become "soft." The higher the vacuum, the more intense is the impact of the kathodal rays on the antikathode, and the stronger and more penetrating will the X-rays be, though from such a "hard" tube the quantity of X-rays is less. From a "soft" tube more numerous, but less penetrating X-rays are given off. Hence in medicine the "hard" tube is employed for photographing denser and deeper parts. And as rays which pass completely through tissues have little effect on them, and only the rays which the tissues stop and absorb affect them, for treatment of those superficial conditions in which X-rays are mainly employed, a "soft" tube is used.

The current through the tube is of 50,000 to 150,000 volts, and is obtained from different sources, from a static machine, from a street current, or from an induction coil, which last apparatus is the most satisfactory. The higher the voltage of the current, the more intense are the kathodal rays and the more penetrating are the X-rays. And in order to regulate the penetrating power of an X-ray tube, various indicators and adjusting mechanisms are employed both for the vacuum in the tube and the current passing through it.

Therapeutic Uses.—I. *The Skin Conditions.*—In using X-rays it is wise to begin with a short experimental first application, for a severe inflammation of the skin may be induced by even the shortest application. Also where the X-rays are directed against one area it is well to protect the neighbouring parts with one or other of various shields—vulcanite, lead foil, &c. To localise the stream of X-rays the focus tube may be enclosed in a cover of, for instance, ebonite-lined iron, with an opening for the escape of the rays, to which a hollow cylinder can be fitted for the rays to pass down.

(*a*) In ringworm X-rays afford the most certain way of cure. A tube with a localising cylinder as described above is so placed that the patient's head is six inches from the antikathode. The affected area is exposed for a definite limited period—usually about twenty minutes. But in order to regulate the duration of the exposure a Sabouraud's pastille—a light yellow pastille of platinocyanide of barium—is placed in the course of the rays. When this pastille changes its colour to a certain shade of brown, a sufficient dose has been given and the exposure is brought to an end—this dose is calculated to be one-fifth of the dose necessary to produce an inflammation of the skin.

Two or three weeks later the hair begins to fall out, and in a week the part is generally quite bald, care being taken to wash or scrape away all the short diseased hairs. Antiseptics either in the form of ointments or lotions are applied daily. This baldness persists for about two months, and then the new healthy hair begins to appear.

Though this is a reliable form of cure, mishaps are not unknown from over-exposure, or from omission of small infected patches. After excessive dosage the hair grows badly, and may be crinkled, and sometimes permanent baldness has resulted.

The fear that the brain might be affected by the application of X-rays to the head has, so far, proved unfounded.

(*b*) *Favus* is treated with X-rays in the same manner. The crusts being removed by preliminary poultices. Indeed X-rays form the only satisfactory line ef treatment. It is interesting to note that this disease was rare in London until the recent alien immigration from Poland and Russia introduced it to the East End, and it speaks for the efficacy of the X-rays that in two years it was practically stamped out by giving X-ray treatment "at a preliminary reception place for these aliens."

(*c*) In chronic localised patches of *Lichen Planus*, where grey scaly patches appear on the legs, the X-rays have produced best results.

(*d*) *Mycosis fungoides*, where nodular ulcerating lumps appear in the skin, formerly considered a hopeless and fatal condition, has been cured, or at least relieved in a wonderful way, by careful repeated daily exposures of different parts, an interval of twenty-one days elapsing before the same area is re-exposed. A slight reddening of the skin is the maximal effect permissible at each *séance.*

(*e*) In *lupus,* on the other hand, or tuberculosis of the skin associated with the formation of "apple-jelly-like nodules" in the skin, the exposures must be longer and more intense, for a greater reaction is required. In small, confined cases some physicians go the length of producing a burn, although the infected is more easily killed than the normal tissue. The surrounding parts must be adequately protected in these circumstances from the action of the rays. Sometimes two or three exposures of a quarter of an hour each are ample, other cases need many more. In treating widespread patches heavy doses are out of the question, and a series of less intense exposures are given. A certain amount of scarring is inevitable, but it is always less than the disease itself would have produced had it been allowed to run its course.

The occasional occurrence of cancer or "lupus carcinoma" in parts which have had X-ray treatment for lupus, is an unpleasant sequel, which, however, is not to be blamed on the X-ray treatment. Probably the rays have merely occasioned the rapid growth of a tumour which would have developed later, and which can, as a rule, be successfully eradicated.

(*f*) Bazin's disease, where livid blue nodules appear in the skin, generally on the back of the calf, and go on to ulceration, is now recognised as another manifestation of tuberculosis, and answers well to similar treatment.

(*g*) In psoriasis, where the skin shows a scaling and reddening in rings or round patches, the use of X-rays is limited by the site of the disease. But on places where there is no risk of loss of hair, a few exposures of ten minutes each will generally cause the disease to disappear.

(*h*) X-rays have been invoked both in hypertrichosis, where the hair grows in abnormal situations as on the faces of women, and in alopecia or baldness. Unfortunately an exposure sufficient to destroy the hair follicles is very apt to produce permanent injury to the skin, leaving it in a dry, parchment-like state. The only moderately safe plan is to give a prolonged series of short exposures, where screens of "filters" are used (as in radium treatment) to cut off the feebler rays which will be caught by, and which will inflame, the most superficial layer of the skin.

Baldness can sometimes be remedied if it is the form of baldness where the scalp is still endowed with a covering of short downy hairs. After the head in such cases is exposed to the X-rays, the first result is the falling out of this short hair during the next fortnight, but if the treatment is successful, in another six or eight weeks the new hair appears.

(*i*) In hyperidrosis, where there is an excessive production of perspiration, with an offensive odour, generally from the sweat glands in the armpit, X-ray exposures are found to inhibit the activity of the glands for a time, and relieve the sufferer from this annoying condition.

(*j*) In cases of pruritus or itching of the skin, if all other measures fail, X-rays may be tried, and are often efficacious. Relief sometimes does not come at once, but begins in about four to eight days' time, and lasts for at least a month, often for years.

(*k*) In molluscum contagiosum, a contagious condition where numbers of small dimpled wart-like growths are found on the skin, the application of X-rays will cause them to disappear. The warty growths, however, are not always grouped so conveniently as to lend themselves to this treatment.

(*l*) The fibrous overgrowth originating in scars, known as keloid, has often been successfully treated with the rays, and where the overgrowth is large, X-rays are superior to carbon dioxide snow. After treatment the scar becomes much smaller, and softer.

(*m*) X-rays are superior to carbon dioxide snow in the treatment of advanced cases of that form of cancer of the skin known as rodent ulcer. Indeed it is only in cases where the ulceration is deep and well advanced that many physicians use X-rays. But as in the use of radium for this disease, where bone or cartilage is involved little can be hoped for from radiotherapy. In the suitable cases, however, within a week to a fortnight after exposure, the ulcer begins to dry up, the discharge diminishes, the excavated area commences to fill up, a new skin grows in from the edges. Healing goes on until a soft, supple scar alone marks the site of the ulcer.

(*n*) Nævi, or tumours made up entirely of the small bloodvessels on the skin, of which the most familiar example is the "port wine stain," can be much improved by this treatment. The method most advocated is to give exposures producing a strong reaction. The risk in such a proceeding makes other treatment, as by electrolysis or carbon dioxide snow, more attractive. X-rays ought to be a last resort in quickly-spreading nævi.

More Deeply-seated Diseases.—Coming to the employment of X-rays in the treatment of deeper conditions than skin diseases, it has first to be noted that here an additional appliance is used, in the shape of a "screen" or "filter," or "shield." For those very soft rays, which are absorbed by and which affect the superficial layers of the skin, are most undesirable in any intense application aimed at deeply-seated tissues, on account of the liability of those soft rays to set up an intractable inflammation of the skin, and so prohibit all further treatment. As, then, with radium, screens are employed, made of various substances and in various thickness according to the intensity of the exposure and its duration. Frequently employed are thin sheets of silver 0·1 millimetre in thickness, or sheets of aluminium 0·4 millimetre in thickness. Such shields will stop all the feebly penetrating rays, and simultaneously permit the strong penetrating rays to pass on unaltered.

II. One of the most constant effects of moderate doses of X-rays is that produced on nerves, which in many conditions shows itself in deadening pain. This "analgesic" property, in addition to relieving pruritus or itchiness of the skin, has been employed in various forms of neuralgia, deadening the pain in the side arising from intercostal neuralgia, or the neuralgic pain associated with herpes zoster ("shingles"), or the very obstinate, often agonising pain of trigeminal neuralgia, where some or all the nerves of the face and front of the head may be involved. For such cases a "hard" tube is employed.

III. As regards cancer, although X-rays have been shown to have a greater action on cancer cells than on the cells of ordinary tissues, and although the growth of a tumour can in some degree be modified by X-rays, this treatment by no means constitutes a "cancer cure." Its chief usefulness is in its application to inoperable cancer, which has ulcerated through the skin. X-rays, by preventing any rapid growth in the ulcer and by relieving or diminishing pain, will often improve the general health of the patient, and prolong his life.

In cases of operable cancer the rays can most hopefully be invoked as an adjuvant to operation, being either applied through the operation wound to the site of the removed tumour, or through the skin.

IV. In lymphatic glands and lymphoid organs, such as the spleen, X-rays somehow produced special modifications, and this action has been utilised in the treatment of diseases in which these structures are implicated. Tuberculous glands, especially in the neck, are now being treated satisfactorily by this means, and the treatment is most satisfactory if begun early, and provided no suppuration has occurred, most cases can be entirely cured. When suppuration has occurred, the abscess should be lanced, and X-ray exposures should begin the following day.

Another disease in which success has been obtained is "spleno-medullary or myelogenous leukæmia," where there are marked changes in the spleen and bone marrow, and where marrow cells escape into the circulating blood in considerable numbers. The spleen, which is enlarged, and the shafts of the bones are exposed to X-rays. Recent methods include daily exposures (or sometimes every two or three days) of ten to twenty minutes, the vacuum tube being some four to six inches from the part to be treated.

The good effects attained in the treatment of this form of leukæmia has raised hopes that X-rays may be a cure, or at least a palliative, in other diseases of a similar type for which so far no satisfactory remedy has been discovered, *e.g.* the leukæmia associated with enlargement of lymphatic glands, with increase in the lymph-cells in the blood, and in lymphadenoma, a disease where there is a widespread enlargement of all the lymphatic glands in the body.

Radium.—Radium was discovered in 1898 by Professor and Mme. Curie. It was a great discovery in a department of science which still is imperfectly understood; and where the chemistry and physics of a substance are not yet known, and indeed to a very large degree still a matter for speculation, it is impossible to pass a final judgment on its potentialities as a curative agent in human disease. And one particular difficulty in the way of its free use, and of wide experiment, has been the scarcity of the element and the consequent prohibitive cost. The bromide of radium, in which form it is most conveniently kept, costs £18 per milligramme, and is usually sold five milligrammes at a time, this amount being in size about one half of a small pea. But while neither its full usefulness nor its limitations have so far been determined, it has been found to be of much service in curing or relieving at least some forms of disease.

The aim in using it is to have it so applied to the body that the actual seat of disease is subjected to its rays, in the hope that the progress of the disease will be arrested, and that, if possible, a complete cure be attained.

Various forms of receptacles have been tried in which the radium bromide may be applied to the body. These "applicators" have all to be devised with a view to the chemical properties of the salt, which is highly soluble, tending to take up water from the atmosphere, hence the desirability of some form of apparatus in which the radium will be preserved from the free contact of air, and which will also keep in the "emanation"—a gas liberated from radium whenever it is heated or dissolved, and endowed itself also with the power of giving off rays.

There are then two main forms of applicators:

1. Where the radium is stored in a closed air-tight box.
2. Where it is mixed with varnish and spread out on a piece of cloth or on a piece of metal.

1. Of the closed receptacle type the commonest and handiest is a small sealed glass tube, which, in order to avoid accidental breakages, is guarded by another metal tube of silver, aluminium, or platinum. The great advantage of a glass tube is that it may be so simply cleaned and rendered aseptic. It should be as small and as narrow as possible, that the radium will not move about inside it, and thus distribute its rays unevenly, and also that it may be introduced through minute openings in the skin into tumours, or into any abnormal channel leading inwards from the skin or from a mucous surface.

Another form of closed receptacle is an ebonite capsule, which is made up of an ebonite disc with a saucer-like depression on one side in which the radium is placed, and protected from moisture and air by a thin plate of mica retained in position by an ebonite cap. In this form of applicator the radium is more spread out, and can be applied to a wider area, and so is more suitable for application to more superficial conditions. For this ebonite capsule an aluminium box has been designed in which it is kept, and a rod can be screwed on to the box, so that the radium may be inserted into cavities such as the mouth.

2. Radium bromide is mixed with hot varnish of special composition, and the mixture is spread on a thin piece of metal or on a piece of linen. The mixture is of such strength that on each square centimetre of surface there is a centigramme of radium. The advantage in employing this kind of applicator is that it has a wide surface from which rays can be given off, and hence it can be used very conveniently in skin affections such as lupus, one application embracing the whole diseased area, whereas several applications of a tube would be necessary in several different places before a similar effect could be expected. It has, however, disadvantages, the radium running more risk of accident, and the effect of the rays being less from this form of applicator, partly because of the varnish, and partly because of the screen which often has to be placed between the applicator and

the diseased part to protect the applicator from damage.

The metal applicator is frequently of copper, and may be of such size and shape as will fit the part to which one intends to apply it. On the copper one fixes a fine layer of thin gauze made of metal, and the hot mixture of varnish and radium is poured into this fine metallic net.

The linen applicator is, of course, more pliable, and can be folded into any shape, but it is more open to damage, and practically always it requires the protection of some screen when it is being used.

The effect produced by the application of radium to the tissues depends on the amount of radium used, and on the length of time the tissues are exposed to its rays. But the rays can be greatly altered as to their effect by interposing screens between the radium and the exposed area. For the rays vary in character and in penetrating power, and most of the rays can be regulated or shut off altogether by the use of screens. Three different varieties of rays from radium have been separated.

1. The alpha rays, which are not really rays, but infinitesimal particles of the new element, helium, constantly being discharged from the radium, and carrying with them the bulk of the radium's energy.

2. The beta rays, which are really electrons or "disembodied charges of electricity without material substance"—these again are not rays.

3. The gamma rays, whose nature is still unsettled, whose penetrating power far exceeds that of the others, and which are undeflected by the most powerful magnetic field.

A screen of notepaper or three inches of air shuts off all the alpha rays, and a screen of lead, one centimetre thick, shuts off all the beta rays. The gamma rays cannot be shut off; they, however, are few in number. Now the rays which pass through and beyond the skin do not affect it, or only slightly if at all. Only the rays which impinge on the skin, and failing to pass through, are absorbed by it, can affect it. Hence the general rules for applying radium at the surface of the skin are:

1. For a surface condition, the screen is unnecessary, and the application is short; for all the rays are attacking the diseased area, including especially the powerful but weakly penetrating alpha rays.

2. For a condition just under the skin, one employs a thin screen, either of silver to the thickness of one-fifth of a millimetre, or of aluminium of half a millimetre thickness. This effectively excludes the alpha rays, and the exposure to the other less powerful and scarcer rays must be longer. The skin is less affected, the thicker the screen, but in that case the exposure will have to be of greater duration.

3. For a condition in the more deeply-placed and more dense tissues, a leaden screen is employed, the thickness varying from one-fifth to one millimetre. Only the "hard" (*i.e.* more sturdy) beta rays and the gamma rays will penetrate, and these will pass through the skin and soft superficial tissues with the minimum of damage and concentrate their effect on the deeply-situated disease. In this case the exposures must be prolonged. Other factors to be considered in fixing the precise duration of an exposure are the age of the patient, and whether or not there has been a previous exposure in the region, for the reaction is much greater in a second exposure than in the first. An instance of typical exposure is the application of ten milligrammes of radium bromide in the ebonite capsule for half an hour to a baby's face for a "port wine stain," a tumour composed of an aggregation of minute dilated bloodvessels in the skin, a *nœvus.* An adult could have an exposure of the same amount of radium for fifty minutes, or with a silver screen, two millimetres thick, for three to four hours, or with a lead screen, one or two millimetres thick, for eight hours.

Sometimes the radium is not brought close to the skin, but kept at a short distance away (one to three centimetres). The result of this is to weaken the effect of the rays, but at the same time disperse the effect over a wider area, which will meet better the requirements of some conditions, *e.g.* port wine stain, where the applicator does not cover the whole area. To maintain it at this distance, blotting-paper in two or three thicknesses, or cotton wool are employed.

But there are also cases where the radium cannot be applied from the outside, and in order to get the radium buried in the centre of some deeply-placed diseased area, the assistance of the surgeon will be invoked. For purposes of burial the radium-containing glass tube, enclosed in a silver sheath, is very convenient. To the silver sheath is attached soft silver wire, by which it may be anchored to the skin with plaster.

A combination of the superficial and buried applications is known as the cross-fire method. Here two or more specimens of radium are placed on opposite sides of the diseased area at the same time, so that the region intervening between them receives a cross-fire of rays. This is especially applicable in such regions as the cheeks or nose, where one specimen is applied on the skin surface, and the other inside the mouth or nose. Or again one specimen can be buried in a growth, and the second applied to the skin surface over the growth. Instead of burying a tube containing radium, an emulsion of an insoluble salt of radium in paraffin and vaseline has been injected on the deep aspect of a diseased part. An applicator placed over the diseased part exposes it to a cross-fire of rays.

But it is possible also to make use of the "emanation" from radium, the gas which radium freely liberates whenever heated or dissolved, and which itself gives off rays. Its radio-activity, however, is vastly inferior to that of radium, diminishing by 50 per cent. in four days. This emanation can be drawn into glass tubes, which are sealed and applied in exactly the same fashion as any similar radium applicator, save that its period of usefulness is limited by its rapid loss of activity. On the other hand its loss, for instance, when buried deep in a tumour or by some ordinary accident, is correspondingly less important.

However, the emanation has other therapeutic uses. Physicians have prescribed it to be inhaled, injected, taken in draughts, or to be included in baths. At the German health resorts considerable use is made of water containing radium emanation. One German expert recommends that the emanation water should be taken two or three times each day, that this should be followed by a prolonged emanation bath, and finally that the patient should inhale the emanation either by a special inhaler apparatus, or in an "emanatorium." At Kreuznach and Wiesbaden on the Continent there are radio-active springs, as in this country at Bath.

The rule of one physician is to order a half to one litre of radio-active water to be taken each day, the strength being one to eight electrostatic units of "emanation." For inhalation the strength is the same. For baths it is much less—0·005 to 0·015 of a unit to the litre.

Baths of radio-active mud are also used, especially in gynæcological conditions. Complete baths of such mud—250 to 300 grammes of mud to the bath of hot water—are given for about twenty minutes. The patient may have a series of daily baths for about a fortnight—intermitting one or two days.

Local applications of mud can be left on for from five to twelve hours.

Prolonged injections of mud—20 grammes to 2 litres of water—are employed for some gynæcological inflammations to relieve pain and discomfort.

There are various earths which can form this mud. One of the most commonly known is obtained in the process of uranium extraction. It is a weak radio-active preparation, but much cheaper than radium. It gives off alpha, beta, and gamma rays, and an emanation—the last provided it is kept moist, hence its use in the form of mud, although in the Paris hospitals it is largely used in the form of a moist plaster.

The latest method of bringing radium to bear on the body is by electrolysis. A compress soaked in a solution of radium bromide is applied over the area to be treated, and is connected up with an electric battery, one electrode being applied to the compress, the other is applied to different parts at different sittings so that the current passes in different directions through the diseased region. The rays penetrate through the uninjured skin at least nine centimetres, and this method has been used for cancerous tumours. The current is passed for about half an hour three times a week.

Radium has been tried for many diseases, and while in many cases it has not been a success, and in others its results have been varying, still it has proved of value in the following diseases:

1. Rodent ulcer, which is an ulcerating cancer of the superficial tissues, most frequently found on the skin of the face. Here, if there is no destruction of bone or cartilage, healing may rapidly be induced. The radium in a glass tube is directly applied to it, fixed in position by a strip of plaster, or if the surface be wide the tube may be fixed some short distance from the surface, so that its rays will be more distributed. No screen is necessary unless the ulcer is near the eye, when a shield of lead foil must be employed to guard the eye. The amount of radium to be used will vary, but for a superficial rodent ulcer on the nose, there is used 10 milligrammes of radium with an exposure of one hour. After the whole ulcer has been subjected to this treatment, no further exposure is made for three weeks, when another dose may be given according to the results already obtained.

Finally one looks for the fading away of the hard margins of the ulcer, the levelling up of the surface, and the covering of the site of the ulcer with soft skin.

2. Other circumscribed growths or lesions of the skin, or of mucous surfaces, especially where tendencies to cancer are suspected. Warts, for instance, after an hour's exposure to 10 milligrammes of radium, either by a kind of inflammatory process or by a kind of absorption, in some weeks will be found to have disappeared.

Cheloid, also, a fibrous growth starting in scars, can be dispelled by radium.

Then in nævi or "port wine stains" as well as in more deeply-placed bloodvessel tumours, or "angiomata," radium is a reliable means of cure. The danger indeed is to over-cure, and damage the tissues after the nævus has received sufficient exposure. Therefore caution is observed, and weak specimens of radium are used, a very convenient applicator for this purpose being that where the radium and varnish are spread on cloth or metal. The exposures are given over a period of months.

In inflammations of the skin associated with pain and itching, and notably in pruritus itself, "the itch," radium is most efficacious. Notably relief has been effected in the inflammation of the skin of the hands from which X-ray operators sometimes suffer. In lupus erythematosus, a skin disease manifesting itself in an angry red scarring of the skin spreading at the margins, a result almost magical has been obtained in the best cases. A crusty scab forms, and when this drops off, perfectly healthy skin is found.

In leucoplakia, where there are displayed white, raised, thickened patches on the tongue's surface, associated with a superficial inflammation of the tongue—often exceedingly painful—the use of radium cause the patches to disappear. The best applicator in such a case is the ebonite capsule in its aluminium container, which is held in the mouth at the end of an aluminium rod.

3. In eye diseases where the disease is superficial. In spring catarrh, where the inner aspect of the upper eyelid becomes thickened, and defies often all treatment, the application of radium to the everted lid has resulted in cure. And correspondingly good results have been attained in superficial ulceration and inflammation of the corner of the eye and the "white of the eye" or schlerotic coat.

4. In malignant growths, in sarcomata, and in cancers—technically sarcomata are not cancers, though practically as malignant, and resembling cancers in many ways. The *modus operandi* for a deep tumour is to bury a tube containing radium in the growth for a considerable time—say one, two, or three days. The tube is then extracted, and after several weeks a second dose may be given if necessary. It is universally admitted that radium treatment of malignant growths does not supplant operation. The following is a quotation from a lecture delivered to the British Medical Association by Dr. Louis Wickham of Paris: "If the surgeon is in the presence of a case difficult to operate in, he should have recourse to radium, to prepare the ground and diminish the virulence, and again after the operation, to consolidate the tissues. The surgeon can also in his turn prepare the ground for radium, and his help should be utilised for making the perforations, incisions, partial extirpations, &c.

which permit the diminution of the thickness of tumours which the rays have to traverse, and to render the application of radium introduced into the wounds more effective." And again: "The tumours must be deluged with rays; for this very powerful apparatus is used in opposition, either in cross fire, or on the exterior surface of the tumour, or by perforations multiplied in the interior of the tumour." He recommends the use of the maximum dose of rays, and while one general part of the procedure is the burying of the radium in the tumour, obviously every and any other method which will bring additional rays to bear will be employed.

Radium is no sure cancer cure. But under its influence malignant growths, especially sarcomata, have demonstrably withered up, though they have not been completely dispelled. And it is held by many to have a particular deleterious action on the cells of true cancers. In combating a disease of which the cure has not yet been discovered, it is then a most precious weapon.

5. In Hodgkin's disease, where there is a general enlargement of the lymphatic glands throughout the body. The glands form great tumours, some superficial, some deep, and can be treated also with radium burned deeply and applied externally.

6. In joint diseases, in subacute and chronic rheumatism, in the arthritis (*i.e.* joint inflammation) associated with gonorrhœa, and in arthritis deformans. Here the plasters of radio-active earths and the mud-baths have been principally used, and certainly with good results in the way of abolishing the pain and swelling that accompany the subacute forms of these joint inflammations.

Carbon Dioxide Snow.—The beneficial results from freezing on certain diseases on the surface of the body have been known for some time, but only the comparatively recent introduction of a cheap and efficient method of producing this freezing has enabled its full benefits to be widely utilised. This is the method which employs "carbon dioxide snow."

This snow can be obtained in various ways. One of the simplest is as follows: A clean duster is so folded as to make a tube, which is applied to the opening in an ordinary cylinder of carbonic acid gas, such as is used in the manufacture of soda-water. The gas is allowed to escape, and condenses on the sides of the "duster-tube" in the form of snow. When sufficient snow has appeared, it is pressed through another narrow metal tube so as to take on the shape of a pencil, in which shape it is most easily handled. One end of this pencil is sharpened to a point, and it is now ready for use. If other shapes are desired, they can readily be obtained by employing other moulds, or by a hammer. A pencil will last for use for two hours before melting. The snow is pure white, and 80° C. below zero, so that the operator must protect his fingers against frostbite, by wearing gloves or else grasping it with a duster or piece of lint. The point should be applied to the skin with a degree of firmness to empty the bloodvessels of the part. The duration of the application varies in accordance with the amount of reaction desired, from ten seconds up to a minute: for it freezes the superficial layers of the skin at once, and with more prolonged application deeper freezing is obtained. After an application the skin is of solid hardness, and white, resembling porcelain, and it is several minutes before the skin regains its normal aspect. The part should have a light dressing of gauze. While the freezing is not painful, some pain, or at least discomfort, attends the thawing of the frozen area, relieved by warm compresses.

Some persons have more sensitive, tender skins than others, and this has to be taken into consideration in deciding on the amount of reaction to be aimed at.

This freezing has been now tried in many diseased conditions of the skin.

In "angiomata," and in "nævi"—tumours made of bloodvessels, of which the port wine stain is the most familiar example—the larger tumours are attacked in a number of sittings held at intervals of a fortnight, only a part of the tumour receiving an application at each *séance*. It has been found that a series of X-ray exposures before the carbon dioxide snow is commenced will accelerate the cure.

A similar result has been obtained in lymphangioma, tumour composed of lymphatic vessels; and warty growths, callosities, and pigmented moles can also be removed by this treatment.

In rodent ulcer or cancer of the skin situated very frequently on the face, it has been found useful before the ulcer has actually developed. Applications of one minute are given, which include the tissues beyond the obvious margins of the disease. When the cancer is in the neighbourhood of the eye, measures must be taken to protect it.

The fibrous overgrowth originating in scars, known as keloid will also disappear under carbon dioxide snow, the applications being long or short, single or repeated, in accordance with the amount of keloid present.

But second to its effectiveness in nævi this treatment has been wonderfully successful in the cure of lupus erythematosus, a skin disease where there is a spreading redness of the surface followed by scarring. The snow is made in blocks exactly covering the patches of disease, and these blocks are applied for a very short space on several occasions, in order that the scarring may be the least possible.

In ordinary lupus, which is tuberculosis of the skin characterised by the presence of "apple jelly" nodules the size of a hempseed in the skin, the essential thing is to get rid of these nodules. The snow pencil is pointed, and pressed firmly over the nodule for a full sixty seconds. Scarring is unavoidable if the treatment is to be effective.

Other skin conditions in which carbon dioxide snow has effected cures are in the tuberculosis of the skin over a deeply-seated tuberculous focus, known as scrofuloderma, in the lesions produced on the hands and faces of X-ray workers by over-exposure, in lichen planus where there is a papular eruption, and in "Oriental sore," a form of ulcer common in Bagdad.

It has also been employed in the treatment of some external affections of the eye, such as rodent ulcer implicating the eyelids, and in trachoma, an inflammation of the lining membrane of the eyelid with the development on it of sago-grain-like bodies. In trachoma the lid is everted, and separated from the eye by some smooth flat instrument. The application is light, and at first no longer than fifteen seconds; it is later extended to thirty seconds if necessary. Applications are given every week.

Massage.—Massage is the manipulation of joints and of muscles, and of other parts, and though literally meaning "kneading," now includes a very large number of ways of applying stimulation by local pressure and percussion, firm and gentle, such as pressing, tapping, hitting, pinching, rubbing, kneading. These manipulations produce several definite physiological results which have made massage valuable both to the physician and to the surgeon.

These results are—

1. A stimulation of the circulation, both of the part massaged and generally. The venous and lymphatic flow are both accelerated, and there is a consequent increase in the amount of arterial blood supplied to the heart. Hence there is increased warmth, increased metabolism in the cells making up the tissues, increased nutrition. Also the improved fresh blood-supply helps in the battle against inflammatory processes, and the removal of the products of inflammation is hastened both by this addition of fresh blood, and by the improved venous and lymphatic flow.

2. A direct stimulation of the tissues. The mechanical stimulation of the massage probably brings about molecular changes—changes in the chemistry of the cells of the tissues, increasing their rate of life, as it were. This again is increased metabolism, and involves an improved circulation, and a general improvement in the health of the massaged part.

3. A certain amount of excitement of nerves, which in cases of neuralgia, for instance, becomes a kind of counter-irritation, hence the soothing effect of stroking or light rubbing of the skin in neuralgia and muscular rheumatism.

The actual manipulations have been variously classed, but the general subdivision is into two classes: (1) "stabile" movements, where only a single area is dealt with by each manipulation, the process consisting in a repetition of the same movement over a number of spots, as, for instance, in delivering a series of taps to a muscle; and (2) "labile" movements, where the masseur passes over and includes a wide area in a single movement, for instance, in stroking.

1. Stabile movements—

(*a*) "Pressing," which is done with the tips of the fingers or with the knuckles. Here, in addition to the pressure, the masseur may add a "boring" element, rotating his fingers or knuckles, so that it almost becomes kneading, and rubbing. Where this type of massage is being applied, the masseur will begin at a spot furthest from the heart, and work towards it, so directing his series of "pressing" movements as to assist onwards the venous blood and lymph. Naturally the pressure will be light, if only superficial parts are to receive the massage, and will be more vigorous if the deeper tissues are to be effected.

These two axioms concerning the direction of the manipulations and their force apply to all forms of massage.

(*b*) "Pinching," where the masseur grips the skin and deeper tissues either with the tips or with the pulpy portions of the fingers and thumb, just below the tips. This grip is but momentary, just a "pinch," and the masseur quickly passes on to another spot.

(*c*) Various kinds of quick blows, ranging from the lightest of taps to quite heavy smacks—all comprised under the name *tapotement*. The movements are rapid and performed from the wrist.

"Tapping" is performed with the pulp of the fingers or with the knuckles.

"Poking" consists in thrusting the finger-tips or knuckles or closed fist deeply into the tissues.

"Chopping" is percussion with the little finger side of the open hand, and "beating" is percussion with the same side of the hand half closed.

The "flail" movement consists in hitting the part lightly with the back of the loosely closed fingers.

To these forms of tapotement may be added "vibrations," often given by mechanical means, but more nicely modulated if given by the hand. Vibrations may be either "stationary" or "concentrating." In the stationary kind the fingers are thrown into rhythmic contractions, ten or twelve a second, giving a rapid succession of light taps. In the concentrating form of vibrations the finger-tips travel over the skin, or even lightly roll the skin in front of them. This, of course, makes it strictly not a stabile, but a labile movement.

The use of these vibrations is mainly to relieve pain, and they are used at a rapid rate for dull, gnawing pain, and at a very slow rate for acute pain. It is recommended that when employed for their pain-relieving properties, they should be directed along the course of the nerve to its root in the spinal column.

2. Labile movements—

(*a*) *Effleurage*, "stroking." This is a surface manipulation performed either with the forefinger and thumb, the palm of the hand following like a roller, or else with the whole hand, open and flat. Each movement is directed towards the heart, and at the finish of the stroke the fingers glide back, keeping in contact with the patient's skin. The perfection of effleurage lies in its lightness and evenness.

This stroking is generally performed first of the masseur's manipulations, the object being to produce as far as possible a general clearing away of the venous blood and lymph lying in the tissues, and then when the manupulations have induced a fresh collection, effleurage is again employed to remove it.

(*b*) *Pétrissage* is the name for all rolling, kneading, and rubbing movements, and is carried out with the finger-tips or knuckles, or perhaps best of all with the pulp of the thumb.

"Fulling," or "light friction rolling." One hand is placed above and the other below a limb, the palms resting on the skin, and both hands then rub to and fro, the action being repeated several times in the same place before advancing.

In "skin rolling" the skin and the tissues immediately below the skin are grasped between the fingers and thumbs, and rolled, and squeezed. This "skin rolling" is much used in face massage, and is of large service in reducing fat on the face, neck, chin, abdomen, and hips.

A minor problem to be solved by the masseur is how to avoid irritation of the skin by the rubbing. This difficulty is customarily met by the use of some soft powder, such as chalk, the parts being well powdered before the masseur begins.

Sometimes, however, this is insufficient, and some lubricant, such as lanoline cream or pure olive oil, has to be employed in certain cases where the skin is rough and hairy, or over newly-healed wounds, or where the tissues immediately under the skin are very thin, *e.g.* in the "skin and bone" condition of emaciation.

It is useful also when splints have been removed, for the skin is then very dry and apt to scale, and the lubricant prevents this to some extent, and also prevents the skin particles flying about.

In addition to massage pure and simple, the masseur in most of his cases carries out movements of the patient's joints. By exercising the joint, all the neighbouring parts are stimulated, and further deeply-placed muscles unaffected by massage are brought into action. Each joint is slowly and gently moved to its full capacity in each direction in which it can be moved. The movements are made with precision and without any too great force.

Such exercises are known as passive movements. Active movements, where the patient exercises the joints himself, are classed under the term Medical Gymnastics.

Massage may be either general or local. General massage is employed where the whole body is in need of bracing up, as in the convalescence from many constitutional diseases where muscular weakness and emaciation are likely to be present, or in cases where the circulation is unsatisfactory, for instance in arterio-schlerosis, where the bloodvessels become rigid and thickened, and transmit only a diminished flow of blood to the tissues.

Or the massage may be directed to some local diseased conditions, as for instance, sprains, bruises.

General massage. This occupies from half to three-quarters of an hour: the average is forty minutes, although, if one is satisfied with "two successive processes of effleurage-pétrissage-effleurage" performed rapidly, general massage can be done in about fifteen minutes. The massage should not be begun until an hour and a half has elapsed since the patient's last meal. And during the treatment the patient must be guarded against chills when exposed: in addition, cold causes the muscles to contract, making manipulation of the tissues difficult. For relaxation is an essential, and each part of the body must be so placed as to produce the relaxing of the muscles—a limb, for example, being either supported by the one hand, while the other hand massages, or else in such a position that the patient need make no effort to keep it in position. The patient should be clothed in some loose garment, night-clothes or a dressing-gown, and covered with two blankets. Only the part at which the masseur is at the moment working should be exposed, and the room temperature should be about 60°.

The movements are roughly in this order: effleurage, then three or four pétrissage manipulations, then effleurage again, then tapotement in one form or another, and then again effleurage.

The masseur begins with the limbs, proceeds to the chest, and then abdomen, and finally the back. Movements of the joints are given to each limb after the massage is finished.

In cases of weakness, in cases where especially the temperature has been over normal, it is well to take the temperature and pulse-rate before commencing, and a second time after finishing, when the massage treatment is given for the first time at least, for any rise above normal in either pulse or temperature would signify that the treatment was more than the patient's strength permitted. During massage, quickened breathing or pallor, or restlessness, are signs of distress, slight or severe, and the massage should be stopped until the symptoms have subsided.

Local massage is employed for both surgical and medical conditions. As a rule, ten to twenty minutes are sufficient for treatment of a local condition. Here the masseur first manipulates the whole surface of the muscles, passing over the injured or diseased part, and exercises the neighbouring joints, and then comes last to the part for which massage is specially required.

The following are some of the commoner conditions in which massage is applied:

1. Stiff joints, resulting from an overlong fixing in one special position, for instance, keeping the arm bent while wearing a sling, or resulting from a simple inflammation of the joint or in the neighbouring tissues. The masseur here aims at getting rid of the thickenings produced by inflammation, and at rejuvenating the muscles whose growth and activity have been so diminished by disease. Hot air, hot water, and hot sand baths, and electrical applications are often combined with simple massage and movements.

There is one very important exception to this line of treatment. When the joint disease has been tuberculosis, massage and movement must not be employed, for it is a disease which becomes dormant rather than cured, and massage and movement may only provide the stimulus which awakens the disease to fresh onslaughts.

2. Inflammatory thickenings in any accessible part other than joints. Possible instances are very numerous. Two recent striking uses are in trachoma, an inflammation with small pinhead-size nodules on the inside of the eyelids, and in ulcers which refuse to heal under all kinds of treatment—for instance, those associated with varicose veins. In trachoma the insides of the lids are rubbed lightly, the powder employed being a mixture of calomel and sugar; in varicose ulcers there is employed first general massage of the whole limb, and then after that "vibrations," both "stationary" and "concentrating," applied round the ulcer, and then actually over the ulcer, which is covered with a single piece of lint for the time being.

3. Contractures of rheumatic and other origin. Here, apart from actual surgical operation, possible only in some few non-rheumatic cases, massage seems to offer the only reasonable hope of improvement.

4. Effusions arising from recent injuries, where effleurage will assist the absorption of blood and serum, hence its use in dispelling the swellings accompanying sprains and dislocations which have been reduced. Massage is at first applied to the part of the body on the side of the swelling next the middle line. The veins and lymphatic vessels are thus emptied, and are ready to absorb the effusion from the injured part, so diminishing the tension of the swelling and relieving pain. As the

tenderness goes, the massage can become vigorous, and ultimately include the injured part.

5. Fractures. Until recently the treatment of fractures consisted in putting the broken bones in some rigid apparatus, such as splints, until the bones had reunited. As a result the muscles were apt to waste from sheer inactivity, and the joints and tendons became stiff, and after the splints were removed it was a considerable time before the broken bones were as useful as formerly, and sometimes even lasting stiffness remained. It has been found that massage and movement of the injured part has given excellent results, a small amount of movement between the broken ends of the bone helping on the formation of the new bone which is to unite them. Furthermore, the pain is much lessened, and the unfortunate stiffness which often results from splints is altogether obviated.

As a general rule the massage and movements ought to be commenced *at once*, that is, on the day of the accident, but in some cases it is not wise to start for a few days.

The method of procedure is first, of course, to bring the ends of the broken bone into position—that is, "reduce the fracture." Thereafter an assistant holds the broken bone carefully to prevent any displacement, and the surgeon applies effleurage to the side of the injury next the body, stroking upwards so as to empty the veins and lymphatics, and to dispel somewhat the effusion, and then stroking actually over the swelling which indicates the site of fracture and over the parts beyond. This effleurage must not cause pain, its aim rather being to relieve pain, and to allay the tendency of the muscles to go into sudden contraction, one of the commonest sources of pain.

The joints of the limb, if it be a limb which is fractured, are gently exercised, and the patient may even be asked to contract his muscles, but while he is so doing, any change in the apposition of the broken ends of bone must be guarded against most vigilantly.

This process will occupy about fifteen minutes. The patient is then placed with the fractured part in a comfortable position, and, if necessary, it is kept thus with sandbags, pillows, or some kind of splinting, not too heavy, which can easily be removed when the massage *séance* is due on the following day. It is a daily process, gradually being prolonged until as much as half an hour is taken. And with recovery the manipulations become more vigorous, and the patient begins active and resisted movements. The supporting apparatus will soon become unnecessary. Massage is continued until the new uniting bone has become quite firm and strong.

This method of treatment was greatly advocated by a Paris surgeon, Lucas-Champronniere, and sometimes is known by his name.

6. Hernia or rupture cannot be cured by massage, but on the other hand in slight cases where the rupture is reducible the abdominal wall can be so strengthened by massage that the patient may be very little troubled by his hernia, and any operation made unnecessary.

7. Bladder troubles, "incontinence of urine," and "retention of urine," may receive vast benefit from massage where the wall of the bladder has lost its muscular tone. The musculature may be much braced up by deep massage directed on the abdominal wall over the bladder. Needless to say the distension of the bladder must primarily be relieved by the passage of instruments if necessary.

8. Varicose veins will not be cured by massage, but massage over the veins may work with other measures to prevent the patient's state growing worse. Among other improvements, it will maintain the nutrition of the skin over the veins, and so help to avert the ulceration of the overlying skin, and the risk of perforation with very severe bleeding.

9. Bony deformities—such as club-foot, or lateral curvature of the spine. The treatment in such cases aims at giving the patient improved use of the deformed part—the bony defect being beyond cure by mechanical means, and in curvature of the spine, for example, movements and massage can be of material benefit. In addition to giving movements, active and passive, the masseur rubs and pinches all the muscles of back and hips, but especially the muscles on the convex side of the curvature.

There are many local medical conditions in which massage can be employed.

1. Headaches have often been relieved by thorough massage of the neck and head, where, of course, the headaches are not due to some organic causes, such as defective eyesight or brain tumour. In addition to vigorous massage of the muscles, the masseur must pay some attention to the nerves of the scalp and forehead, vibrations or gentle stroking being employed.

2. Paralysis following, *e.g.* apoplexy. It is wise here not to begin massage until about three weeks after the stroke. The masseur here has two objects:

(*a*) To treat the affected muscles and their nerve-supplies with massage.

(*b*) To overcome the contraction of the antagonistic non-paralysed muscles by massage and movement.

In the paralytic conditions associated with lead poisoning, accident, diphtheria, anterior poliomyelitis (infantile paralysis), massage has proved itself very valuable in maintaining the nutrition of flaccid limbs, and has in some cases been credited with a curative power.

More knowledge of anatomy is required by the masseur for the treatment of these diseases than for any other.

3. Locomotor ataxia. Rubbing and pressing of the back, and pulling and shaking the legs, have been of considerable help. The most useful is the leg-pulling. The patient lies on his back. The leg is grasped at the ankle and above the knee, and pulled steadily downwards. Carefully applied, the most severe ataxia pain is alleviated. It is important to avoid jerking.

4. Neuralgia, including sciatica. For sciatica a brief set of manipulations is—

1. Stroking of back of limb.
2. Percussion and beating, and pétrissage over the nerve.
3. Flexion and extension of the limb.
4. Raising the leg.
5. Beating of sacrum and limb.

For neuralgia in superficial nerves kneading, stroking, and vibrations will often abolish the pain after a few sittings.

5. Progressive muscular atrophy. Here there is required massage near and over the affected muscles, with such movements as will increase the circulation through the diseased parts.

6. Writer's cramp can be cured by massage. The whole limb is massaged, though especially the muscles of the hand. Exercises of the fingers hand, and arm play an important though secondary part in the cure.

7. Affections of the respiratory organs, such as bronchitis, nervous asthma, &c., are often treated by strokings of the chest, the patient breathing deeply meanwhile.

8. In this connection may be mentioned an exercise which has been found excellent in developing children with flat or depressed chests. The patient lies on his back, and the operator, standing above the head, grasps the arms above the elbows and lifts them well over the head in a horizontal position, carrying them out away from the body, and then over the head until the hands meet behind. He holds them so far a few seconds, then carrying them back to their original position, he presses then with fair firmness on the sides of the chest.

9. Some inflammations of the nose and throat are relieved by massaging the neck and throat. The resulting emptying of the bloodvessels reduces the congestion which is so big a factor in the discomfort associated with catarrhs in this region.

10. In disease of the heart, movements are recommended, and a whole system of exercises for patients suffering from cardiac disease has been elaborated by Dr. Schott, of Nauheim in Germany. These exercises will be found under the section dealing with the Nauheim treatment.

But in addition general massage, and some local massage of the chest, with hacking in small circles over the heart, have been employed. And sometimes vibrations also are applied over the heart. These vibrations are sometimes produced by a mechanical vibrator which is placed upon the arm of the masseur, whose fingers, loosely bent and separated, are placed on the cardiac region, and wave-like motions are transferred through his fingers to the patient's chest.

11. In diseases of the digestive organs, especially in the dyspepsia where there is "atony" of the stomach or intestines, that is, a want of tone, a laxness of the gastric or intestinal muscles, as for instance, in chronic constipation. The patient lies on his back with his knees drawn up in order to relax the abdominal muscles. Pressing, kneading, shaking movements can all be employed.

For treating habitual constipation the masseur, in addition to general abdominal massage, must pay special attention to the large intestine, kneading and pressing along its course, that is, up the right side of the abdomen, across the upper part, and down the left side.

12. Piles. This condition, known medically as piles, is a result of a congestion of the veins of the abdomen in a large number of cases, and abdominal massage has been frequently found to relieve the sufferers from piles.

13. Enlarged liver. Here massage of the liver with clapping and vibrations has proved helpful. It is wise to associate with massage such exercises as improve the venous circulation generally in the trunk.

14. Uterine disorders. Atony and displacements are sometimes thus treated.

15. Menstrual disorders are much improved in many cases by massage, such as has been indicated for piles and enlarged liver, which will relieve congestion in the venous system.

16. Lumbago and stiff neck are relieved by massage over the affected muscles—stroking being especially grateful to the patient. The addition of a few passive movements will likely complete the cure.

17. Gout. Friction applied to the foot between the attacks will often diminish both the severity and the frequence of the paroxysms.

Kinesitherapy.—Medical Exercises and Gymnastics.

The use of movements and exercises in medical treatment is no new thing, being known to physicians of classical times. And now with the advance in physiological knowledge the possibilities in this method of treatment have been fully recognised, and in a very large number of conditions physicians are calling movements and exercises to their aid.

Movements may be active, *i.e.* performed by the patient himself, passive when his limbs and trunk are moved by some trained operator, resisted when the patient's movements are made against a certain amount of resistance offered by doctor, nurse, or trained operator.

Passive movements have been described along with massage. Of resisted exercises the most noteworthy are the famous Nauheim exercises described in connection with the Nauheim cure. Active movements for descriptive purposes are best classified according to their therapeutic uses in treating local and general conditions.

The following are their chief local uses:

1. In sprains, dislocations, and fractures, where after a certain time has elapsed for the repair of torn, injured tissues, the patient is directed to move the affected joints and limb. These movements are carried out under supervision of a surgeon or masseur at first. There is no special procedure, save that the joint must be moved in every direction as freely as possible.

2. In subacute and chronic inflammatory conditions, where joints are liable to be affected, or indeed are infected, or after an acute inflammation of a joint, movements should be carried out as above, in order to prevent the joint becoming stiff through "adhesions" forming between the opposing surface in the joint through the inflammatory process.

3. In deformities which are becoming or which are liable to become worse, of which the two commonest examples are flat-foot and spinal curvature.

For flat-foot, where the arch of the foot is not entirely gone, suitable exercises have been arranged. They are:

(1) Rising on the balls of the toes, which are directed straight forward.

(2) Rising on the toes, with the great toes touching and the heels directed outwards.

(3) Rising on the toes, bending the knees, straightening the knees, and then coming down on the foot again.

(4) Walking on the outer side of the foot.

(5) Tracing out circles in the air with the great toe.

Naturally these exercises are carried out barefooted.

For special curvature there are two sets of exercises. The first consists of a series of movements of the spine, while the patient is in the "keynote position." That is, he stands with one arm directed *outwards* from the shoulder, and the other directed *upwards* from the shoulder, so that the curvature of the spine is temporarily corrected; *e.g.* in a curve with the convexity to the right, the patient directs his left arm upwards, so that the spine is pulled straight. The first series may be supplemented by ordinary exercises to strengthen the muscles of the back. Or instead of taking up the keynote position from the beginning the patient may be suspended from a bar or rings with one shoulder higher than the other, so correcting the curvature.

The second set of exercises known as Klapp's, consists of crawling four-footed exercises. The child goes down on hands and knees, and crawls along the floor in imitation of a quadruped; that is at each step the hand and knee of one side are brought closer to each other, while the hand and knee of the other are widely separated. The result of this mode of progression is that the spine is curved first from one side and then to the other. Hence if the patient crawls in a circle he will curve one side of the spine more than the other; hence to open out a concavity to the left, he crawls in a circle to the right. The hands, knees, and toes are protected with suitable gloves. The exercises are practised three times a day for from a quarter of an hour to an hour.

To be of any real value any exercise which is to counteract deformities must be systematically and regularly practised.

In addition to these principal exercises for these deformities, there are many other exercises devised, and many other deformities which have been treated by exercises, with only varying degrees of success.

4. Nervous diseases associated with loss of muscular co-ordination are sometimes treated by means of exercises—the great success being with locomotor ataxia, where the patient, who has lost the power of performing simple acts with accuracy, *e.g.* walking along a straight line, is set to perform systematically a series of easy exercises—walking along lines chalked on the floor, guiding and steadying himself perhaps with a go-cart, tracing out circles on the floor with his foot, going up and down a model staircase, &c. The aim is to open up new nerve-connections to replace the old inefficient ones. This is known technically as Re-education.

But medical gymnastics can be employed to improve the general power and tone of the body in many conditions, *e.g.* general debility and neurasthenia, in circulatory diseases (except aneurisms and incompetence of the aortic valve) in disorders of metabolism, *e.g.* gout, and in such alimentary disorders as constipation. This is *Physical Culture*, which is now more familiar because of its non-medical exponents than because of its use by physicians and surgeons. Among the very numerous systems and names of these non-medical exponents, it is sufficient to mention Sandow, Müller, Ling, McFadyen.

Sandow has devised a system of physical culture which is now widely known and practised. Essentially it consists of exercises with dumbbells, with or without a strong rubber apparatus. The latter may be fastened to the wall or attached to the body. His system has produced excellent results.

Müller uses no apparatus in his system. He prescribes a number of movements to be performed before and after a bath. One striking feature of his system is his advocacy of self-massage—his clients or patients being directed to rub themselves after their bath, this as a part of their exercises. He also advocates running in the open air.

Ling was the originator of the Swedish movements, which comprise almost all kinds of rhythmic movements which the body can conceivably perform. These movements are carried out, the patient occupying one or other of five positions—standing, sitting, lying, kneeling, suspending—suspending meaning hanging from an overhead bar. The movements are classified as rotation, flexion and extension, separating and closing, bending, raising, pulling, turning, elevation, and depression. They are active or resisted, or passive—that is performed by the patient with and without the resistance of the operator, and also the limbs and trunk are moved by the operator with and without the resistance of the patient. It is impossible to detail all the exercises, which sufficiently indicate the practical defect of the Swedish system—the time the movements take to carry out.

McFadyen the American has also exercises and forms of physical work which he prescribes. At his private sanatorium his clients are put through a strict course of training. He has invented a strenuous game-exercise with an enormous handball which the players throw about.

Of medical systems several have been devised, of which the best-known is the Nauheim set of exercises, described fully in connection with the Nauheim cure. In medical gymnastics, as distinguished from those of popular physical culturists, the object is to strengthen and brace up the muscles of the trunk mostly, and such exercises can practically all be carried out without apparatus. Different physicians will prescribe different exercises as regards detail, the general requirements, however, being that the exercises be performed sharply and suddenly, that in consecutive exercises the same muscles should not be employed, that attention should be paid to the breathing, the ordinary exercises being intermitted with occasional special breathing exercises, and that between exercises there should be no long pauses, and that the exercises are always well within the limits of the patient's strength.

D. G. Watson, M.B.

DISEASES: THEIR DIAGNOSIS AND TREATMENT

This section is arranged alphabetically under headings which include not only definite diseases, *i.e.* more or less constant symptom-groups, but also the chief individual symptoms (any one or more of which may be common to several diseases), and organs or regions of the body, with the various maladies affecting them.

In the case of the commoner complaints their features will probably be so well known that they are at once recognised, and it will only be necessary to read over the disease in question for confirmation of the diagnosis and advice as to treatment.

When the condition is not so obvious it will be necessary to look up either the part of the body affected or the special symptom which is causing trouble. Here reference will be found to the various diseases which may give rise to the particular symptom complained of, and these in their turn will have to be consulted in order that a diagnosis may be come to by seeing with which one *all* the symptoms and signs present correspond.

The chief symptoms which are likely to be consulted thus are: Backache, Breathlessness, Colic, Constipation, Cough, Diarrhœa, Dropsy Expectoration, Fever, Hæmorrhage, Headache, Inflammation, Pain, Paralysis, Stools, Urine, Vertigo, and Vomiting.

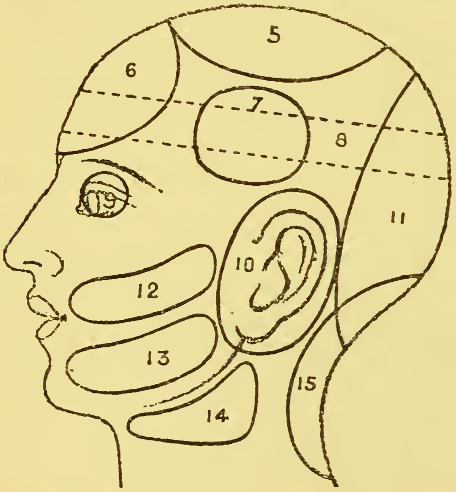
In connection with Pain, which is the commonest of all symptoms, charts are given which illustrate the chief causes of pain in different parts of the body. A consideration of these will often be found useful as a guide to the possible causes of the pain.

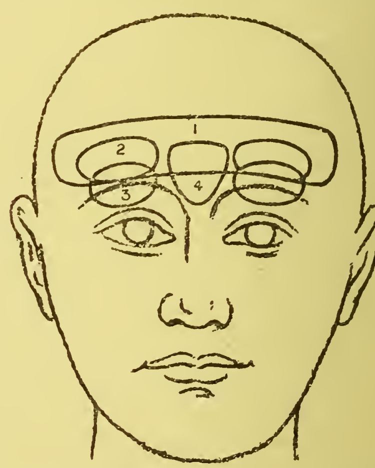
It may be that after all it is found impossible to come to a definite opinion, and this is not to be wondered at, for disease is infinite in its variety, and even those who are dealing with it every day are often in doubt; but at least some idea should be gathered as to the possibilities, and as to the urgency or otherwise of obtaining a doctor's opinion and advice.

It is, of course, impossible to give here full details of the treatment of all diseases, and unnecessary, because so much of it is of a highly technical and skilled nature, but the attempt has been made to indicate all the more important lines of treatment, and to give in more detail such measures as may be adopted in cases where a doctor's advice either cannot be obtained or is thought really not necessary. It is also pointed out when there should be no undue delay in obtaining skilled advice, and what treatment may safely be undertaken until this is obtained.

In the case of accidents and emergencies the First-aid section should be consulted.

In connection with Treatment, the details of nursing and feeding the patient have not been gone into, so that as a rule, and more especially in the case of invalids confined to bed, it will be necessary for these points to consult the sections dealing with Sick-nursing and Cookery.





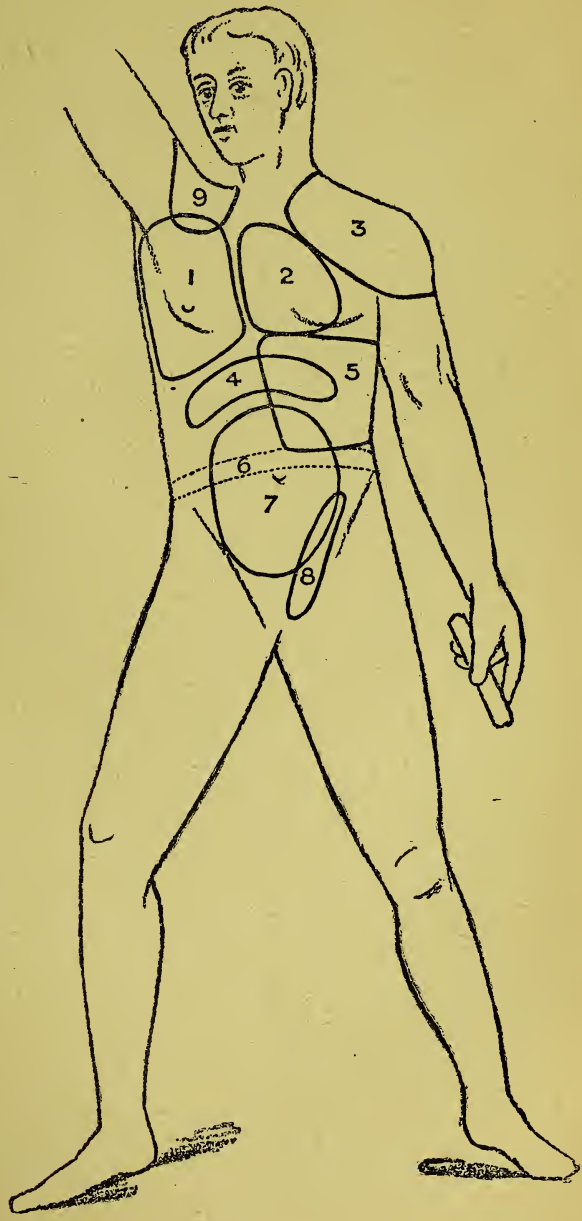
Chief Causes of Localised Headache and Pain in the Head, Face, and Neck.

1. Constipation. 2. Dyspepsia. 3. Eye-strain or Affections of the eye. 4. Affections of the nose and air-chambers connected with it. 5. Anæmia, Neurasthenia, Rheumatism of scalp, Diseases of women. 6. Anæmia, Neurasthenia, Bright's disease, Dyspepsia, Constipation, Eye-strain and diseases, Rheumatism of scalp, Nasal disorders. 7. Neuralgia, Migraine, Affections of eye, ear, or teeth. 8. Neurasthenia. 9. Colds, Migraine, Eye diseases. 10. Various ear affections, Mastoid disease, Bad teeth, Rheumatism of jaw-joint, Cancer and ulcer of tongue. 11. Eye strain, Neurasthenia, Affections of womb, Meningitis, Affections of the cerebellum, Rheumatism, Syphilis, Affections of upper part of spine. 12. Affections of upper jaw bone, or upper teeth, Neuralgia. 13. Mumps, Bad teeth, Neuralgia, Disease of lower jaw bone, Actinomycosis. 14. Tonsillitis, "Sore throat" Pharyngitis, Laryngitis, Diphtheria, Scarlatina, Abscess, Cancer in throat, "Glands in neck." 15. As 11, also "Sore throat" as in 14. Very marked in cerebro-spinal meningitis.

Pain in joints may be due to—Acute or chronic rheumatism, Rheumatoid arthritis, Gonorrhœa, Synovitis, Gout, Tubercular disease, Scurvy, Rickets, Some nervous diseases.

Diffuse pain in the limbs may be due to—Neuritis, Muscular rheumatism, Meningitis, Influenza, Rickets, Trichinosis, Scurvy.

See also female diagram.



1. Pleurisy.
   Pneumonia.
   Muscular rheumatism.
   Neuralgia.
   Pericarditis (if on left side).
   Aneurism (if on left side).
   Shingles.
   Flatulence (if on left side).
   Phthisis.

2. Anæmia.
   Palpitation.
   Various heart disorders and valvular disease.
   Angina pectoris.
   Gastric catarrh.
   Gout.

3 and 9. Rheumatism.
   Neuritis.
   Neuralgia.
   Pleurisy (occasionally).
   Dilated stomach.
   Disorders of large bowel.

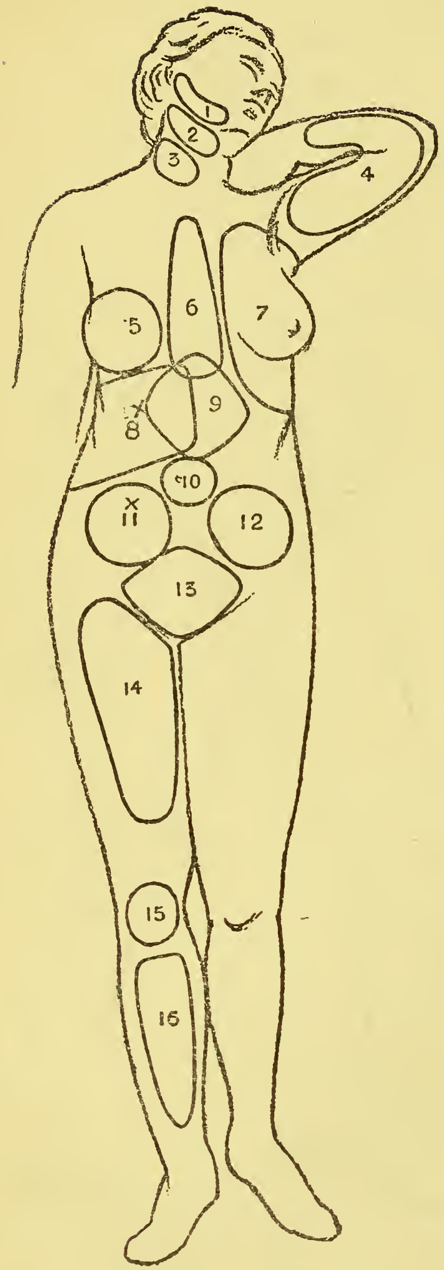
4. Pleurisy.
   Severe vomiting or coughing.

5. Gastric catarrh, ulcer, cancer.
   Dilated stomach.
   Enlarged spleen.
   Colitis.
   Movable kidney.
   Renal colic.
   Acute rheumatism.

6. Girdle sensation in affections of spinal cord.

7. *Diffuse general abdominal pain, often colicky.*
   Appendicitis (early stages).
   Peritonitis.
   Intestinal tuberculosis.
   Obstruction of bowels from any cause.
   Colic.
   Flatulence.
   Indigestion.
   Cancer.
   Gastro-enteritis.
   Spinal disease and Pneumonia (in children).

8. Renal colic.
   Mucous colitis.
   Hernia.
   Varicocele.
   Constipation.



⁂ *Except in the case of obviously female diseases, the areas marked apply equally to both sexes.*

1. Mumps, Toothache, Neuralgia, Disease of lower jaw-bone, Actinomycosis.

2. Tonsillitis, "Sore Throat"—Pharyngitis, Laryngitis, Diphtheria, Scarlatina, Abcess, Cancer in throat, "Glands in neck."

3. Muscular rheumatism, Spinal disease (upper portion), "Glands in neck."

4. Rheumatism, Neuritis, Some diseases of spinal cord—one or both arms, Affections of spine—usually both arms, Angina pectoris—usually left arm, Writer's cramp, &c.

5. Affections of Breast, Pregnancy, Disease of ovaries or womb, Hysteria.

6. "Heartburn" of Dyspepsia and other stomach diseases, Bronchitis, Aneurism of aorta, Angina pectoris, Influenza, Growths in chest, Bone disease—breastbone or backbone.

7. Pleurisy, Pneumonia, Shingles, Neuralgia, Muscular rheumatism, Phthisis.

8. Diseases of liver, Gallstones or Disease of gall bladder (especially at X), Pneumonia or Pleurisy (may be even lower down, especially in children), Muscular fatigue, Cancer in neighbourhood of outlet of stomach, Movable kidney, Valvular disease of heart, Acute rheumatism.

9. Stomach diseases, Irritant poisons, Duodenal ulcer and catarrh, Diseases of pancreas, Cholera, Rheumatism, Pneumonia, or Diaphragmatic pleurisy—in children especially.

10. Hernia, Ulcer of stomach, Gallstones, Spinal disease—at level of waist.

11. Appendicitis (special tender point at X), Typhoid fever, Colitis, Hernia, Disease of right ovary, Obstruction of bowels.

12. Colitis, Constipation, Hernia, Disease of left ovary, Obstruction of bowels.

13. Affections of Bladder, Diseases of ovaries or womb, Inflammation in pelvis.

14. Diseases of ovary or womb (one or both sides), Neuralgia, Renal colic (one side), Psoas abscess, Inflamed glands in groin, Abdominal tumours, Appendicitis (right side), Phlebitis.

15. Loose cartilage, Disease of knee-joint, Disease of hip-joint.

16. Rheumatism, Bone disease, Phlebitis, Neuralgia, Neuritis.

Chief causes of Pain in various regions of the back of the Body.

1. Eye-strain, Neurasthenia, Affections of womb, Meningitis, Affections of the cerebellum, Rheumatism Spinal disease.

2. Same as 1, also affections of the heart. Very marked in Cerebro-spinal Meningitis.

3. Right side—Aortic valvular disease and Aneurism, Liver diseases.

   Either side—Rheumatism, Neuritis, Neuralgia, Pleurisy (occasionally), Dilated stomach.

   Left side—Colitis, Pleurisy affecting diaphragm.

4. Dilated stomach, Flatulence, Gastric ulcer, Acute gastric catarrh, Spinal disease, Rheumatism.

5. Affections of spleen.

5*a*. Frequently a specially tender point in liver diseases.

6. Constipation, Gastric ulcer (frequently a specially tender point at X).

7. Lumbago, Any acute feverish disease especially influenza, smallpox, dengue and tonsillitis, Tiredness, Debility, Kidney diseases, Flatulence, Constipation.

8. Affections of reproductive organs—especially in women, Sciatica, Disease of rectum, Piles, Hip-joint disease.

9. Piles, Anal fissure, or fistula, Ischio-rectal abscess, Coccygeal neuralgia, Pruritus ani.

10. Sciatica, especially along line of nerve, with particularly tender points at XX, Affections of rectum. If both sides, probably some Tumour in pelvis, Locomotor ataxia, or Diabetes.

11. Cramp, Over-exertion, Diabetes, Gout, Varicose veins.

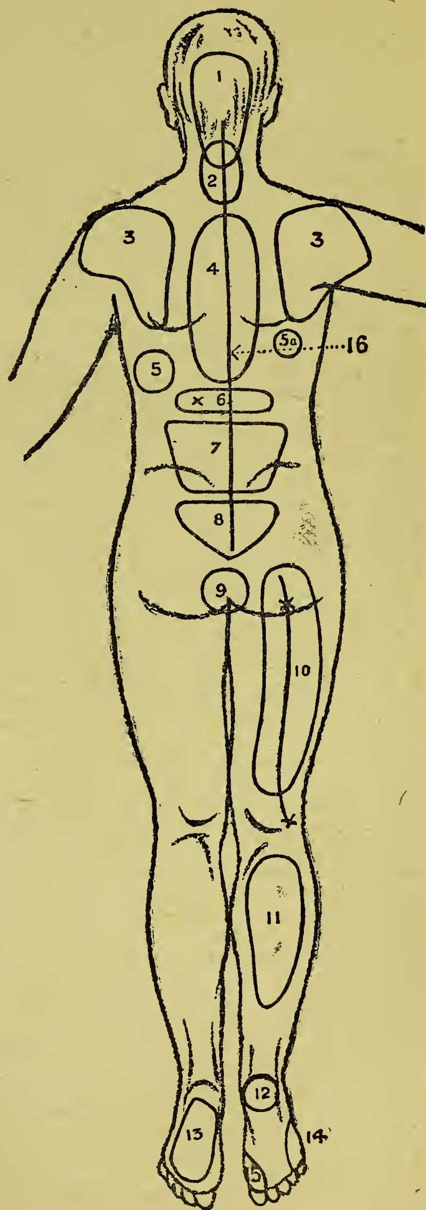
12. Gout, Neurasthenia, Ovarian disease.

13 Neuralgia, Flat foot.

14. Corns—any toe, but chiefly small one, Neuralgia.

15. Gout, Bunions.

16. Tenderness or pain at various points along the spine = Diseases of spine or spinal cord, Acute feverish diseases, Rickets, Hysteria, Neurasthenia (especially after accidents), Meningitis.



DISEASES

Abdomen, Diseases of.—So many important organs lie in the abdomen, any of which may be the seat of disease, that full descriptions must be looked for under the particular organ, symptom, or disease concerned. Only the general symptoms and signs of abdominal disease will be referred to here, as affording some guide in coming to a diagnosis, which must be made before rational treatment can be commenced.

Pain is one of the commonest and most important of the symptoms. It may be paroxysmal and cramping as in colic, gnawing as in cancer of the stomach, agonising and shooting through to the back from the right side from the passage of a gall-stone, or down into the groin in the case of renal colic (*i.e.* a stone passing from the kidney to the bladder), or it may take the form of a gripping girdle pain as in locomotor ataxia and in some spinal diseases. Pain with straining at stool (tenesmus) indicates an affection low down in the bowel. The *site of the pain* is an important guide. In many acute conditions it is vague and general to begin with, and may remain general, especially if there be peritonitis; it may, on the other hand, become localised or be confined to one spot from the outset. Thus pain below the ribs on the left side usually points to the stomach as the cause, but stomach pain may also be referred to a point between the shoulder-blades. Affections of the liver and gall-bladder may have pain localised over them, or it may be referred to the right shoulder. Pain which is worst round the navel may be due to peritonitis, or simply to colic (irregular movements of the small intestine). Pain low down in the abdomen, if on the right side, may come from the appendix; on the left side or at the anus it indicates a rectal origin usually; if in the middle line it suggests some trouble of the bladder or womb.

Tenderness, which is pain or soreness on pressure, usually accompanies spontaneous pain, but not constantly, as either pain or tenderness may exist separately. There is always some tenderness over the seat of an inflammation. In appendicitis there is, as a rule, great tenderness low down on the right side of the abdomen. In more chronic diseases, such as ulcer or cancer of the stomach, pressure over the painful part may aggravate, or it may relieve, the pain.

Vomiting is present in many abdominal diseases, but may also be a reflex act from irritation of many other organs. As an isolated symptom it is probably due to some irritant in the stomach, and will cease when the stomach is emptied; if persistent, and particularly if the vomit be fæcal in character (*i.e.* consisting of the contents of the intestine, and like a liquid motion in appearance and odour), it indicates some obstruction in the bowels, and is of serious import.

Constipation as a symptom is common, and has many causes. When obstinate and not yielding to appropriate remedies it arouses suspicion of intestinal obstruction, especially if associated with vomiting, distension, and pain.

Diarrhœa is of much more importance than constipation, which may be merely a habit. Diarrhœa may be acute or chronic. By far the most common cause is some form of irritation or inflammation of the bowel, but, whatever the cause, it is always a complaint to be taken seriously.

Headache, *loss of appetite*, *hiccough*, *heartburn*, *flatulence*, and *thirst* are amongst the other common features of abdominal disease.

On examining a person with acute abdominal disease, the aspect is frequently characteristic. The patient lies on his back, with a rigidity of attitude and shallow respirations which betoken the pain that any movement produces, whilst one or both legs are drawn up, according as the inflammation is limited to one side or has become more general. In colic there is often great restlessness, which contrasts vividly with the fixed attitude of serious inflammation.

The appearance of the abdomen itself must be noted. Is there any swelling? General fulness, as has been remarked, may be due to "fat, fluid, or flatus." Fat may be distinguished by pinching up the abdominal wall in the hands; fluid is present in the dropsy of heart, liver, or kidney disease; flatus or gas arises from the decomposition of food in the intestine in the subjects of habitual constipation, or it may be due to chronic obstruction of the bowels. Tumours may cause general fulness, as, of course, does also pregnancy in women. Any local bulging will point to an affection of the organ lying where the swelling is situated. Retraction of the abdomen may merely be a sign of wasting; it is seen also to a marked degree in meningitis. Cessation of movement of the abdomen on respiration is an important sign of peritonitis. Distended veins on the surface, especially round the navel, are often present when there is obstruction to the flow of blood through the liver. The pulse and temperature should be very carefully noted in abdominal diseases, and particularly in acute conditions; a small, rapid pulse is of the gravest significance, as it usually means some acute inflammation, even though the temperature be not raised.

Treatment.—For details of treatment the individual diseases must be referred to. It should be said here, however, that many abdominal diseases are of a serious nature, and that their exact diagnosis is often a matter of the utmost difficulty; therefore, unless the cause of the condition is obvious, and it is one easily amenable to treatment by simple measures, there should be as little delay as possible in getting skilled advice, particularly as in many cases surgical interference is necessary. Thus nausea, vomiting, or diarrhœa traceable to some indiscretion in diet may readily be cured by an emetic or a purgative; but severe pain, obstinate vomiting, or signs of obstruction should be considered beyond the scope of home treatment. Pain, indeed, may demand immediate relief, and it is best obtained by means of hot fomentations or poultices applied over the painful part; it should never be deadened by the indiscriminate use of morphia or laudanum, because, although it sounds a little cruel, pain is often the best—nay, the only—guide to the surgeon as to the necessity for immediate operation. The same warning against delay applies also to the more chronic affections. Simple indigestion may become incurable if allowed to run on too long; cancer of the stomach begins with comparatively trifling symptoms, but it is only when it is recognised in the early stages that there is any hope of removal, &c. &c. (See under STOMACH, INTESTINE, LIVER, SPLEEN, PANCREAS, KIDNEYS, APPENDICITIS, PERITONITIS, OBSTRUCTION, VOMITING, DIARRHŒA, &c. &c.)

Abdomen, Injuries of.—*Contusions* or *bruises.* The symptoms attending a contusion of the abdomen, whether caused by blows or the passage of heavy bodies—such as vehicles—over the abdomen, &c., are not always such as to call attention to the seriousness of the injury present. The gravest abdominal injuries may co-exist with practically no external or general signs of mischief, the patient walking a long distance, perhaps, with only a little local pain where the blow had been received. Visible bruising of the abdominal wall may or may not be present, but the external appearances are no criterion as to the condition of the internal organs. Sudden death, indeed, may result from a blow on the abdomen without any injury being found. A blow over the solar plexus is one of the well-known knock-out hits in boxing, and the inhibition, or shock to the nervous system, may be fatal. Whether or not the internal organs are injured depends largely upon whether the abdominal wall is slack or tense at the time of injury. The chief danger is rupture of one of the internal organs. The stomach and the empty bladder, from their protected positions, are seldom ruptured; the distended bladder, on the other hand, and the intestines more commonly suffer. The liver—from its weight, perhaps—is more often ruptured from falls or crushes than blows; the spleen, when enlarged from malaria or any other cause, may rupture from a mere tap; rupture of the kidneys, as a rule, only follows on very severe crushes. In the case of solid organs like the liver and spleen, the chief danger is extensive or even fatal internal hæmorrhage; in the case of the hollow organs, acute peritonitis from the escape of their contents into the abdominal cavity. The symptoms that may be expected are pain, restlessness, vomiting, prostration, pallor (sometimes attaining lividity), cold sweats, and rigidity of the abdominal wall. The symptoms are at first, indeed, largely those of nervous shock; if the collapse and pallor gradually become more marked, internal bleeding is to be feared. A few hours after the accident the symptoms often quieten down, and if, by the end of twelve or twenty-four hours, there are no complications, probably no serious injury is present. If, within that time, the abdomen becomes distended from the escape of intestinal gas, the walls rigid, and the pulse rapid and weak, then peritonitis has probably ensued on a rupture.

The treatment at first is that for shock (*q.v.*), keeping in mind that it is not advisable to give stimulants by the mouth, as they may find their way into the abdominal cavity. Rupture of any of the organs is almost inevitably fatal if surgical measures are not taken; and, as a rule, the sooner they are taken the better.

Wounds of the Abdomen.—Non-penetrating wounds do not differ in their character and treatment from wounds elsewhere. In the case of penetrating wounds, such as gun-shot or stab wounds, as with contusions, the external appearances and early symptoms afford little clue to the extent of the internal injuries. As a rule it may be taken that some organ or structure will be injured, although occasionally everything is missed by the bullet, &c. The dangers are the same as those complicating contusions. If there is any protrusion of bowel through the external wound, it should, if clean, be returned. A simple method of accomplishing this is to raise the middle of the patient's body by means of a pillow, when the protruding loop will quickly slip back. The abdomen often, but by no means always, requires to be opened to have the injuries repaired. Extensive injuries are almost necessarily fatal if not quickly cleaned and stitched up. If skilled aid can be obtained early, it is probably better to have the abdomen explored in the case of bullet wounds also, as the risk from the operation is less, in most cases, than that from hæmorrhage or peritonitis. It should be stated, however, that the experience of the South African and other recent wars has shown that, if surgical aid can *not* be got promptly, it is far safer to leave the patient absolutely alone and not to move him for forty-eight hours. During this period he should simply be covered and kept warm, given nothing by the mouth, not even a drop of water, and kept quiet. The perforations made by modern high-velocity bullets are so small that, with perfect rest, very little of the contents of the injured organ escapes, and they quickly heal up naturally; but movement both keeps the wounds open and shakes more of the contents out into the abdominal cavity, thus greatly increasing the risk of peritonitis. The attainment of perfect rest, both to the bowel and to the patient, is greatly aided by the administration of 30 drops of laudanum, which might safely be repeated after six or eight hours.

Abortion.—Abortion is the term used to denote the expulsion of the products of conception, alive or dead, from the womb, during the first six months of pregnancy. Sometimes it is only applied to expulsion during the first three months, the term "miscarriage" being used from the end of the third month to the seventh month; after that period, as the child is capable of living, it is called "premature delivery." Here, the terms abortion and miscarriage will be used synonymously. Abortion occurs most frequently during the first three months of pregnancy, and, since there is a tendency for it to happen at the time when a menstrual period is expected, it may then pass undetected. The causes of abortion may be due to disorders affecting the father, the mother, or the child itself. It may result from the following paternal influences: advanced age; lowered vitality, due to overwork or excesses, especially venereal; to syphilis and tuberculosis; and to noxious influences, such as chronic lead poisoning or alcoholism. The same causes act in the mother, and with more certainty if both parents are affected by them. In addition, the following noxious influences frequently promote abortion: tobacco (factory workers), carbon disulphide (women in india-rubber works), chronic gas poisoning, and general bad hygienic surroundings, especially insufficient food. Among local causes, fibroid tumours and displacements of the womb are the most frequent causes. Sexual excesses, acute fevers, and some chronic diseases, such as diabetes and heart disease, may also cause miscarriage, as may falls, blows, or even severe mental emotion. Certain diseased conditions affecting only the child or its membranes usually also end in abortion. No drug has the property of producing abortion with any certainty, although certain substances are sometimes taken or given with this criminal intent. The most that can be said is that some drugs may cause abortion in predisposed women, but more by the general disturbance of the system than by any special action on the womb.

Pains, like early labour pains, and bleeding, or "flooding," are the two main symptoms by which threatened abortion may be suspected. It becomes inevitable (1) when the membranes are ruptured and the waters escape, (2) when the child is dead, or (3) when any part of the child has passed into the neck of the womb.

Treatment depends upon whether the condition is threatened or inevitable. For the former complete mental and physical rest in bed are demanded. The hips should be slightly elevated on a pillow, and only light and cool food taken. To arrest the contractions of the womb 20 drops of laudanum may be taken in a wineglassful of water; or get from a chemist 2 oz. of fluid extract of Viburnum prunifolium, and take a teaspoonful every four hours.

If the pains and bleeding do not stop within twelve hours, the services of a doctor or of a midwife should be sought at once. If severe, do not wait so long before sending. When abortion becomes inevitable, the treatment becomes quite different; the object then to be desired is the complete and entire expulsion of the contents of the womb as speedily as possible. The features of abortion are similar to those of ordinary labour, and it should be managed with the same care. Many women suppose that less attention is necessary, but this is a great mistake. The womb is, as it were, caught unawares, and severe hæmorrhage is more apt to occur than in ordinary labour. Another complication, when not looked after properly, is that fragments of the afterbirth are apt to remain attached in the womb, where they rapidly give rise to foul discharge, which may be followed by grave blood-poisoning.

When habitual abortion occurs, some constitutional or local cause must be sought for, and, if possible, removed. Of the former the principal is undoubtedly syphilis; the local causes are chiefly displacements of the uterus or diseased conditions of its internal lining. To effect a cure the causal condition must be removed or cured. (See Labour and its Complications, and Women, Diseases peculiar to.)

Abrasion.—This means simply the rubbing off of the superficial part of the skin or of a mucous membrane. The only treatment required is cleansing with a simple antiseptic lotion, such as boracic lotion, in order to prevent infection with germs.

Abscess.—An abscess is a collection of pus or "matter," accompanied by more or less pronounced swelling on the skin, due to a local inflammation caused by infection with pus-forming microbes. Abscesses may be acute (or warm) when due to pus-forming organisms alone; or chronic (or cold), which are mainly due to the bacillus of tuberculosis.

Acute Abscesses.—Two factors are usually responsible for the formation of an abscess: (1) the presence of bacteria; (2) lowered vitality on the part of the tissues, which renders them liable to bacterial infection. Among the remote causes of abscesses, therefore, must be reckoned chills, or the presence of diabetes, Bright's disease, or fever, in all of which the resisting power of the tissues is weakened. Wounds, the merest scratch even, which break the continuity of the skin, or any injury to the lining membranes of the nose, mouth, alimentary tract, urinary passages, &c., may also permit of the entrance of germs and the formation of an abscess; as, more rarely, may the irritation set up by the presence in the skin of some chemical substance, such as croton oil, or some foreign body, such as a bullet.

A cavity is formed through the bacteria killing and liquefying the tissues round the area of infection, and in this cavity collects the pus or matter, formed of the dead bodies of the white blood corpuscles, which have been poured out to attack the invading microbes. This pus has to be got rid of, and usually it forces its way to the surface along the path of least resistance, forming the visible swelling. Sometimes it has to burrow some distance before finding an outlet on the skin, and secondary abscesses are set up; or, if the resistance of the individual is small, it may get into the blood and set up general blood-poisoning or septicæmia.

Symptoms.—The chief symptom of an abscess is the presence of a swelling, which is red and hot and painful. If the abscess is *deep*, the pain is dull and diffused over a wider area; but if it is *superficial*, the pain is more intense, sharp, and lancinating, and localised in the centre of the swelling. The temperature rises—in deep abscesses it may reach 104° F.—and there may be delirium and rigors (shivering fits). When a cavity containing fluid has formed, this may be detected by placing a finger at one side of the abscess and tapping with another at the opposite side, when a thrill from the motion of the fluid will be felt. As the cavity distends and approaches bursting-point, the skin over it becomes thin and shiny: the abscess is "pointing" to the place at which it will burst. In the case of deeper abscesses the overlying skin is boggy, and "pits" on pressure.

Treatment.—The best thing to be done as soon as the formation of an abscess is detected is to apply a bread or linseed poultice; or, better, an antiseptic hot fomentation. If a poultice is used, it must be really hot to be of any value. The kind of poultice about which the patient says, "That *is* nice and comfortable, nurse," is of no earthly use. Both poultices and fomentations alleviate the pain, and they either prevent development of the abscess, if it has not gone too far (causing it at length to disappear), or bring it more quickly to a head, if it has already partially developed. The fomentation has this advantage, however, that it cleanses the skin for incision if the abscess has to be opened. It is applied by wringing out a cloth in boiling water, to which carbolic acid has been added (in the proportion of 1 in 40), laying it on the swelling, and covering it over with a piece of mackintosh or waterproof sheeting, and then with a thick towel. The affected part should be rested (the pain will usually ensure that this is done), and if dependent, such as the leg, should be supported on a couch or in bed. If the swelling increases and the pain becomes throbbing, it is better to call in a doctor and have the abscess opened. It is not wise to allow it to burst and cure itself naturally, as that means greater destruction of tissue and longer time to heal; nor is it advisable to open it oneself with a knife or needle, owing to the risk of opening a blood-vessel, of spreading infection, or of not opening it in the best situation for draining. As abscesses do not usually form when the individual is in sound health, attention to the general health is advisable, and a tonic, such as Easton's syrup (a teaspoonful before meals, thrice daily) or Fellow's syrup (a dessert-spoonful after meals, thrice daily), should be taken.

Chronic, Cold, or Tuberculous Abscess.—These abscesses, which are directly due to the tubercle bacillus, may attain a large size, and last for months without being detected. There is, as a rule, no pain or tenderness, no redness until the abscess is just about to burst, and no extra warmth over the swelling, although the patient may be found to have a little fever when his temperature is taken. Children and young persons are chiefly affected. The spine, the hips, the genito-urinary tract, joints, and lymphatic glands are the organs most prone to the tubercular process giving rise to cold abscesses. How the tubercle bacilli reach these situations need not be discussed here; it need only be said that it is not likely to be through any local skin wound, but from the interior of the body. Persons with cold abscesses, as is the case with the subjects of tubercular disease of the lungs or elsewhere, are always in a condition of poor general health. If the abscess is left to burst, or if opened and treated carelessly, mixed infection with other germs is sure to occur, and the patient becomes exhausted by the ensuing hectic fever. If the original tubercular focus cannot be eradicated, the outlook for the patient, on the whole, is not very favourable. (See TUBERCULOSIS.)

Treatment.—In this instance prolonged and skilful treatment is always required. Whatever is done, the abscess must not be opened at home with the idea that mere letting out of the pus will cure the condition. *It will not,* as the bacilli are always thickest, not in the pus, but in the ragged walls of the abscess cavity, and they are not got rid of by draining the pus away. In the earlier stages cure can sometimes be obtained by absolute rest to the part; this is attained by the use of splints and plaster of Paris bandages, jackets, &c., which may have to be kept on for months. In more advanced cases various operative measures and other modes of treatment are employed, but all these are too technical to be described here. Remember that the patient requires treatment as well as the abscess, and, as the disease is a tubercular one, he must be treated accordingly. He should live practically entirely in the fresh air, preferably at the seaside; the diet must be a nutritious one, including a free supply of milk and eggs. Tonics should be taken, especially cod-liver oil (from a teaspoonful, increasing up to a tablespoonful, three times a day, after meals) or syrup of the iodide of iron (in teaspoonful doses, thrice daily, after food). Treatment with "tuberculin" is often also advisable.

Abscesses in Special Situations.—Alveolar abscess (see GUMBOIL), abscess of bone (see BONE, DISEASES OF—acute and chronic inflammation), abscess in the brain (see BRAIN, DISEASES OF), abscess of the breast (see BREAST, DISEASES OF), abscess in the finger (see WHITLOW), iliac abscess (see APPENDICITIS), ischio-rectal abscess (see RECTUM AND ANUS, DISEASES OF), abscess in the lung (see LUNG, DISEASES OF), abscess in the liver (see LIVER, DISEASES OF), psoas abscess and retro-pharyngeal abscess (see SPINE, DISEASES OF). See also under EAR, GLAND, and JOINT DISEASES, and ACTINOMYCOSIS.

Acne.—This is the medical term for the eruption of pimples with black heads so often seen on the face of young people between fourteen and twenty. The pimples—or "blackheads," as they are sometimes called—are situated in the mouths of the sebaceous, or fat-secreting, glands of the skin, and are composed of layers of horny cells arranged like the scales of an onion in the mouth of the gland, and blackened with dirt. They block up the secretion of the gland; but it can often be squeezed out as a coil of yellow, cheesy-looking material. Many of the blackheads remain as such; others set up irritation, festering occurs, and pustules form, or even hard lumps, going on to little abscesses in the deep layers of the skin, the healing of which leads to considerable scarring. The disease is practically confined to the period of adolescence, being rare after the age of thirty. It affects both sexes alike, but the worst cases are seen in the male. The part of the body usually affected is the face, especially the forehead, nose, and chin, but it may be met with on the chest or back. The skin is always greasy, anæmic, and flabby, and there is often an associated seborrhœa, or dandruff, of the scalp. The cause of the disease is almost certainly a special organism—the acne bacillus—either alone or associated with others.

Treatment.—Time alone will cure most cases, if the patient is content to wait until he enters the thirties, but few will be satisfied with such a *laissez-faire* policy. The general health requires attention, plenty of exercise in the open air being taken, and the food should be plain, fats and greasy articles being avoided. In girls, constipation and bloodlessness are often present, and must be treated. Drugs internally are not of much service, although some cases are benefited by the drinking daily of half a tumblerful of fresh brewer's yeast. The local treatment requires perseverance and vigour; what it is to be depends on the stage the individual case has reached. Where the blackheads are numerous and yellow pustules few, the face should be steamed or bathed with very hot water every night, then some of the blackheads may be squeezed out by a gentle pressure or shaking movement with a finger on either side. This must not be done by brute force, nor should the nails be used close up to the blackhead, as such methods bruise the tissues and tend to the formation of the pustules it was intended to prevent. A sulphur soap should then be rubbed on, and a vigorous lather produced with a shaving-brush. For the first few days the lather may be rubbed off, but as the skin becomes accustomed to its use it may be rubbed in longer and longer, until finally there is none left to wipe off. One night a week the skin should be given a rest and simply anointed with vaseline. If the blackheads are very numerous and the skin, as is usual, very tolerant, even more forcible measures may be recommended for mechanically expressing the contents. One of the best is an occasional washing with Brookes' soap, the sand in which rubs off the tops and facilitates the action of the sulphur soap. When pustules are present, a soothing sulphur and calamine lotion

℞ Precipitated sulphur	1 drachm
Calamine	2 drachms
Zinc oxide	2 ,,
Glycerine	1 drachm
Distilled water	Up to 4 ounces

Mix, shake, and paint on with a brush night and morning

should be employed for a few days before commencing the use of the sulphur soap, or, if they are not very bad, the soap treatment may be used, only less vigorously. In severe cases the pustules, and even more the deeper abscesses, require to be opened and their contents evacuated. They will then heal rapidly if the face is kept bathed frequently with boracic lotion to prevent fresh inoculation of the raw surfaces. When healed, soap treatment of the rest of the face may be commenced.

A few cases prove resistant to such measures, and may require the use of X-rays, electricity, vaccines (emulsions of sterilised acne bacilli, &c., injected hypodermically), or other measures, but they are rarely seen if the treatment described above is conscientiously carried out.

Acne Rosaceæ.—See under Nose, Diseases of the.

Acromegaly.—This is a rare, slowly-developing disease, appearing in middle life and characterised by an overgrowth of the extremities and head. There is no difficulty in recognising a well-developed case from the massive and gigantic appearance of the head, the huge nose, the great projection of the lower jaw, the enormous hands, and the rounded shoulders. The condition is associated with, if not actually due to, some diseased condition of the little pituitary gland which lies in a hollow in the base of the skull. The subjective symptoms —those complained of by the patient—consist in headache, dimness of vision, and pains in the joints. There is usually slowness of thought, and perhaps actual drowsiness. No known treatment has any effect, but the condition may spontaneously cease to progress.

Actinomycosis.—A disease usually taking the form of hard swellings about the mouth, which break down to form abscesses which will not heal. The pus from the abscesses contains little yellow granules. It is a chronic infection caused by the "ray fungus," and is far more common in cattle than in man. In them it usually affects the lower jaw, producing a swelling which gives the disease the popular name of "lumpy jaw," or the tongue may be involved, producing the so-called "wooden tongue." The disease is not a very infectious one, but it may be transmitted from beast to man by chewing straws or grain which has been soiled by the slobber of an infected animal. More often it is caused by eating raw grain or inhaling the dust of grain, on which the fungus naturally lives, but it seldom affects thoroughly healthy people. Infection by the fungus results in the development of hard swellings. These break down to form abscesses, which, after bursting, form ulcers or discharging channels that will not heal. The character of the discharge usually leads to a diagnosis, as it contains little sulphur-yellow granules consisting of masses of the fungus. In man the swellings may be about the mouth, or they may be in the lungs or intestines, if the infection has been inhaled or swallowed.

Treatment consists in surgical measures when the growth is so situated as to be within reach—viz. free removal of all diseased tissue, and good drainage afterwards. Potassium iodide is also an effective drug when given internally in doses of from 20 to 60 grains a day, dissolved in water, it having a specific action against the fungus. Treatment must in all cases be prolonged, as the swellings may reappear after the disease has apparently long been cured.

Addison's Disease.—In this disease, named after the physician who first described it, the most striking features are pigmentation or bronzing of the skin, and loss of strength. The condition is due to a diseased state of the suprarenal glands, which lie one at the upper end of each kidney, or of the tissues around these glands. The diseased condition of the glands is most commonly tuberculosis, but anything—hæmorrhage, tumour, &c.—which destroys the glands or prevents their secretion, which is essential to life and wellbeing, from entering the system, may cause the disease.

The most characteristic symptom, although by no means always the first to appear, is darkening of the skin. The degree of coloration varies from light brown to almost black; it may be over the whole body, but is usually patchy, and appears first on the exposed surfaces (face, neck, and hands), and on regions normally somewhat pigmented (groins, armpits, &c.). The next most prominent feature is general weakness; the individual complains of being very easily tired, and, indeed, of a constant sense of fatigue. "Invincible languor" well describes his state. There is usually anæmia, the pulse is feeble, palpitation of the heart is complained of, also vomiting and diarrhœa. The disease, as a rule, progresses steadily, although periods of betterment may occur; but cases seldom live more than two or three years, and sometimes much less. It should be mentioned that abnormal pigmentation of the skin does not necessarily signify that the individual has got Addison's disease, as it may arise from other causes, such as abdominal cancer, cirrhosis of the liver, vagabondage and want of soap and water, prolonged use of arsenic, &c., or even simple pregnancy.

Treatment.—Very little can be hoped for in the way of improvement. From the brilliant success of thyroid treatment in myxœdema (*q.v.*) it was hoped by analogy that the use of suprarenal preparations would be equally efficacious in this disease, but unfortunately this has not proved to be the case. The benefits resulting from their use, if any, are only temporary. This specific treatment should, however, be tried, the dosage and mode of administration being regulated by the doctor. General and symptomatic treatment is important. The sufferer must give up all active work and spend most of his time resting. The diet should be plain but not too restricted, and meat should be allowed. Cod-liver oil, and iron and arsenic tonics are of considerable value. When vomiting occurs, the diet will have to be regulated, and liquid or peptonised food given. Iced champagne in small quantities is often useful. (See VOMITING.) Strong purgatives must be avoided in view of the tendency to troublesome and exhausting diarrhœa.

Adenoids.—The condition known as adenoids should be suspected in any child who snores at night, or who constantly keeps the mouth open. By adenoids is meant an overgrowth of the glandular tissue normally found at the back of the upper part of the throat, where the nose opens into it. This glandular tissue is similar to the tonsils in structure, and enlarged tonsils usually co-exist with adenoids. The condition is common in childhood, but seldom appears before the fifth year, and, even if left untreated, tends to disappear after the age of fifteen. The causes are not fully known. It is common in cold and damp climates and in weakly children, and seems to run in some families. Most cases appear, however, to develop after one of the acute fevers, such as measles, whooping-cough, &c. The adenoids give rise to local symptoms, and to more distant symptoms directly due to the obstructed breathing. As a local result of blockage we find that the child constantly keeps his mouth open to breathe through, and snores at night. The open mouth gives him a dull, stupid expression. There is a constant tendency to nasal catarrh, the speech may have a nasal twang, and there is deafness from catarrh in the Eustachian tubes which lead from the upper part of the throat to the ears. The respiratory obstruction, especially if the child is weak or rickety, is apt to lead to deformity of the chest—pigeon-breast, &c. By reason of the imperfect aeration of the blood the growth is stunted, and the child is languid; to this and to the deafness the backwardness of these patients is due. They sleep badly, nightmare is common, and there is reason to believe that asthma and convulsions may sometimes be due to adenoids. Patients with adenoids are more than ordinarily liable to infectious diseases, and the growths themselves may subsequently become the seat of tubercular disease.

Treatment.—It will be seen that, although the condition tends to cure itself ultimately, its continuance for even a few years leads to such dire results, both physical and mental, that earlier measures are imperative. No instructions can be given for their prevention, beyond seeing that children are taught to breathe deeply and through the nose, and that there is no tight clothing interfering with breathing. Every child is the better of being made to spend a few minutes, night and morning, taking long, deep breaths through the nose. There is no medicinal treatment for adenoids. Except in the mildest cases—those in which the child can sleep with the mouth shut—the adenoid growths must be removed by operation. The operation of scraping them away is a comparatively mild one, although requiring an anæsthetic. It is usually combined with the excision of the enlarged tonsils, and there is seldom any reason for delay once the condition has been recognised. After the operation, breathing exercises are even more valuable than before. These are too often neglected, but it is a great mistake to omit them, as, owing to the child not having been able to fill the lungs properly, the chest is never well developed, and may even be deformed. The child must be patiently and systematically taught before a mirror how to breathe at all times through the nose, and, by taking deep breaths for a few times several times a day, to expand the lungs and chest.

Adiposity.—See OBESITY.

Ague.—See MALARIA.

Alopecia.—See BALDNESS.

Amenorrhœa.—See MENSTRUATION, DISORDERS OF.

Anæmia.—Anæmia, or bloodlessness, is a common accompaniment of many diseases ("secondary anæmia"), but is often so striking a feature that it appears in itself to constitute the disease ("primary anæmia"). The secondary anæmias may be briefly disposed of.

Secondary anæmia is directly due to loss of blood from such causes as hæmorrhage, from wounds, or from ulcers in the stomach, &c.; from excessive menstruation, after childbirth, &c.; or to the draining away of albumin from the blood by prolonged suckling, by long-lasting suppuration, or by the albuminuria of Bright's disease; or to the chronic blood-destroying action of poisons like malaria, lead, sewer-gas, &c. Intestinal parasites may also cause severe anæmia, even of a pernicious nature. (See under PARASITES.) The features and symptoms of secondary anæmia are, generally speaking, similar to those of chlorosis (*vide infra*). The treatment in the first place is essentially that of the primary condition causing the anæmia. Iron tonics will in most cases also be indicated.

Primary Anæmias.—There is still some difference of opinion as to whether the primary anæmias are really primary in the sense that the impoverishment of the blood is directly due either to defective formation or to excessive destruction of the blood. Possibly they are really secondary, due to some cause or causes outside the blood altogether. At all events three varieties fall to be considered under this heading—viz. chlorosis, septic anæmia, and pernicious anæmia.

1. *Chlorosis.*—The anæmia of young women. This form, which is by far the commonest, and which is ordinarily meant when a patient is said to be "bloodless," is practically confined to girls and young women between the ages of fifteen and twenty-four. There may be a hereditary tendency to the disease. The chief factors in its causation seem to be overwork, or rather constant strain, not necessarily very heavy, in surroundings where there is not much light and the air is bad. This accounts for the peculiar frequency of chlorosis in girls of the domestic servant class. A young man of sixteen probably has harder work, but he is not so constantly at it, and he gets more actual rest, and much more fresh air. The girl is possibly subject also to other anæmia-producing factors. These are: excessive loss of blood by menstruation; bad digestion, leading to defective utilisation of the iron in the food; and constipation, with self-poisoning by foul matters absorbed from the bowel, and consequent diminution of the red blood cells. The changes in the blood are diminution in the number of red cells, still greater diminution in the amount of hæmoglobin, and an increased wateriness of the blood.

Symptoms.—The sufferers are nearly always plump, and often have a deceptive redness of the cheeks, but the skin as a whole takes on a peculiar pallor of a greenish hue. The gums will also be seen to be pale. The girl is easily tired, and complains of breathlessness and palpitation on any extra exertion, such as going up a stair. There may even be fainting from dilatation of the heart. Headache is common; the appetite is usually poor and sometimes perverted, so that there is a craving for curious articles of diet; flatulence and acidity are also frequently present, and gastric ulcer may follow. Constipation is so constant and persistent that it is regarded by many as *a* cause, if not *the* chief cause, of the condition. The mental condition is one of slight depression or apathy. Menstrual disturbances are the rule—frequency or irregularity at first; later on, usually stoppage of the periods.

Treatment.—In severe cases three weeks' rest in bed will do more to effect improvement than any other measure that may be adopted, and in all cases rest will greatly aid the operation of other measures. Fresh air and plenty of sleep are also essential to a complete cure. Iron is *the* medicinal remedy which should be employed, but before commencing its use it is often necessary to correct digestive disturbances and to remove constipation, more especially as iron has a tendency to disturb the functions of both stomach and bowels. (See DYSPEPSIA and CONSTIPATION.) The dyspepsia will probably be best relieved by 10 grains each of baking soda and carbonate of bismuth taken as a powder before meals; the constipation is best treated by a good dose of salts every morning. Then iron may be given, and probably the best all-round form is the old-established Blaud's pill, of which one may be taken after each meal to begin with, gradually increasing the dose to three thrice a day. The iron should be persevered with for some weeks, or even months. Other individual symptoms do not, as a rule, require treatment. If the condition does not clear up under such treatment within a month or two, it may be suspected that the condition is complicated by septic anæmia.

2. *Septic Anæmia.*—This form is a fairly common, although not hitherto a well-recognised type. It often complicates other forms of anæmia, and may be so severe as to simulate pernicious anæmia, but unlike it, is very amenable to treatment if taken in time. It is really a form of secondary anæmia, although not always recognised as such, due to poisonous absorption from some place of suppuration in the body, and consequent blood destruction. One common source of the trouble is chronic catarrh and suppuration in the nose or its accessory cavities. The patient becomes so habituated to this that he swallows large quantities of pus (matter) daily for years, never thinking anything about it, and then wonders why he becomes ill! The most frequent seat of the septic mischief, however, is the mouth: rotten teeth, suppuration of the gums round decayed roots, tartar, unclean plates and stoppings, &c. It should be noted that the anæmia is often so great that the usual evidences (redness and pain) of inflammation and suppuration are absent, and intensely septic conditions in the mouth are on this account frequently overlooked. The symptoms of septic anæmia are like those of severe chlorosis, except that the complexion is pale and muddy, there are often hæmorrhages from the gums, and there is usually some occasional fever. Nervous symptoms are not uncommon. The changes found in the blood on microscopic examination are more marked than in chlorosis.

Treatment.—The chief indication is the discovery and removal of the underlying sepsis. For mouth cases the services of the dentist will usually be needed, and here a stitch in time or rather a stopping in time will certainly save nine visits to the doctor. A yearly or half-yearly visit to the dentist for overhauling will prevent the development of many troubles which are not always easy to cure. Apart from the removal of decaying stumps, &c., much may be done by swabbing the teeth and gums several times a day with a 1 in 40 carbolic lotion. In many cases the mouth sepsis extends to the stomach; this may be suspected if there is bad indigestion and foul breath. The best drugs for the stomach are those with disinfectant properties, especially salol (10 to 20 grains in powder thrice daily before food), or perchloride of mercury ($\frac{1}{2}$ to 1 teaspoonful of the liquor). Recovery will be rapid, even in severe cases, *after the removal of the sepsis of the mouth*, seldom even requiring the use of iron.

3. *Pernicious anæmia.*—An anæmia of older life. This is a rare but very severe form of anæmia which may be grafted on a septic anæmia, and may be a specific form of it; or which may be "pernicious" from the outset. The disease develops slowly, and is characterised by an intense blood destruction which is easily recognised by a microscopic examination of the blood—the red blood cells being enormously diminished in number and showing other peculiarities. There are often periods of improvement or even remission, lasting, it may

be, for years, but probably no case ever recovers completely from the disease; hence the name "pernicious." It is commoner in men than in women, and the sufferers are middle-aged or elderly. The skin becomes of a lemon-yellow colour, there is great languor and feebleness, dyspepsia and diarrhœa are common, the temperature is often raised, and nervous and mental symptoms are apt to come on.

Treatment.—Iron is of no use in this form of anæmia. The only drug which seems to have any good effect is arsenic, which has to be pushed until large doses are being taken, but this must be done with judgment and under medical supervision lest arsenical poisoning occur. Bone-marrow spread on bread and eaten raw has sometimes seemed to do good. Any septic condition about the mouth or elsewhere must, of course, be attended to, while those who believe that pernicious anæmia is a specific form of septic anæmia recommend the use of anti-streptococcic serum.

Aneurism.—An aneurism is a localised dilatation of an artery, due to a yielding of the vessel wall. It is practically a tumour filled with blood and communicating with the interior of an artery, consequently the striking feature of aneurism is the presence of a swelling which pulsates with every heart-beat, although this cannot always be made out in aneurisms situated internally, such as on the aorta.

Causes.—The causes of aneurism may be grouped under two headings:

1. Changes in the vessel walls, by which their resistance to the pressure of the blood inside is diminished. A healthy artery is elastic, and yields as the blood is pumped into it at each heart-beat, but under certain conditions the walls become diseased (see Arteries, Diseases of), lose their elasticity, and at some particularly weak spot the wall gradually gives way, stretches, and an aneurism is formed. The subjects most likely to suffer from the condition of the arteries predisposing to aneurism are those who have worshipped too much at the shrines of Bacchus or Venus; in other words, heavy drinkers or persons who have had syphilis. Occasionally the weakening of the vessel walls is due, not to a general condition, but to a local injury, such as a blow, a penetrating wound, or the pressure of something tight, such as a garter behind the knee.

2. Increase in the blood-pressure is another essential to the formation of aneurisms, and the most common origin of this is heavy strain or exertion, which leads to irregular excitement and increased action of the heart. Steady, laborious employment is not so apt to bring about the formation of an aneurism as a violent effort, in which for the time being every power is strained to its utmost. The followers of Mars and Vulcan—soldiers and blacksmiths—have long been known as peculiarly liable to suffer from aneurism.

Taking the two essential causes into consideration, it will readily be understood why aneurisms are more frequently seen amongst men than in women, in the proportion of seven to one; and also why this disease is much more common amongst Anglo-Saxons than among the more lethargic and ease-loving inhabitants of the south. The condition is usually met with in men in the forties.

Any artery may be the seat of aneurismal formation, but the commonest situation is on the arch of the aorta, quite close to the heart, where the blood pressure is highest. More rarely they occur on the abdominal aorta. They are also found sometimes on the arteries of the limbs, but seldom further from the heart than the elbow or knee; they are also not uncommon on the arteries of the brain.

The symptoms naturally vary considerably with the situation of the aneurism and with its size. If it be in a limb, a swelling will be seen which pulsates at the same time as the heart's beat. The swelling is expansile in all directions, so that if it be lightly grasped between two fingers in any direction the fingers are separated. If the artery be compressed between the swelling and the heart, the pulsation ceases, and the tumour diminishes in size and becomes softer. It is generally painless, unless it happen to press on a nerve; it does not feel specially warm, nor is the skin over it red, as in the case of an abscess, unless the aneurism be on the point of bursting. If the aneurism be internal the first symptom may be rupture and sudden death of the patient from hæmorrhage, or it may attain considerable size and then begin to give rise to symptoms from pressure on surrounding organs. When on the thoracic aorta there may be breathlessness from interference with the heart's action, or from pressure on the windpipe; cough and changes in the voice from pressure on the lungs, bronchial tubes, or nerve to the larynx; and difficulty in swallowing from pressure on the gullet. Pain is also likely to be present. This may merely be a feeling of oppression in the chest, or it may be shooting in character, and is then often felt down the inside of the left arm, or it may be aching in nature like rheumatic pains (and is apt to be mistaken for these and pooh-poohed), when it is due to pressure on bone (breast-bone or back-bone). Later on this form of pain is apt to become excruciatingly severe. (See Angina Pectoris.) If the aneurism grows forward a pulsating swelling will be seen on the chest wall above the heart. The diagnosis is very difficult in cases of abdominal aneurisms, as they do not, as a rule, attain any great size. Do not be led to think there is an aneurism merely because there is pulsation to be seen or felt in the abdomen; vigorous pulsation in the abdominal aorta is very common, especially in nervous people. Cerebral aneurisms are usually quite small, and in most cases give no sign of their presence until they rupture and the patient dies. If there are any signs they are the same as those of tumours of the brain.

Aneurism is always a serious condition owing to the liability to rupture and death from bleeding, either externally or into one of the cavities of the body. Although with care a person may live for a number of years, he can never lead an active life.

Treatment.—Nature's method of cure consists in the tendency for the blood in contact with the diseased vessel wall to clot and thus to obliterate the aneurismal sack. Our aim is to aid this process in every way possible, but it is rare that a perfect cure can be obtained. Even if one aneurism does become obliterated, the condition of the vessel walls is often such that others form. A word in the first place as to the surgical measures: these are applicable only to aneurisms in the limbs or neck. Wire, hair, or other substances may, under aseptic conditions, be introduced into the aneurism to obliterate it; if the blood supply of the part can be kept up by other channels, the artery on which the aneurism is, may be tied; or pressure may be kept up for some hours or days on the artery on the heart side of the aneurism, thus diminishing the force of the stream through it and allowing the blood to clot more easily. Medical measures are usually combined with these, and in internal cases they are the only means available. The circulation must be kept as quiet as possible so as to encourage clotting, and diminish the tendency to further enlargement and rupture. Complete rest is therefore imperative. By keeping in the recumbent posture the number of heart-beats per diem can be reduced by thousands. All violent movements and straining must be avoided; care must therefore be taken not to allow the bowels to become constipated. The diet recommended is a very spare one, with no stimulants or condiments likely to make the heart beat faster; it should also be a very dry diet. The somewhat extreme method of treatment associated with the name of Tufnell allows only ¾ lb. of solids and ½ pt. of liquid per diem. Few persons will submit to such starvation, however, and it is doubtful if the results warrant such extreme restriction. The most valuable drug is iodide of potash, which is found both to lower the blood pressure and to relieve pain. Not infrequently morphia has to be given.

Angina Pectoris.—By angina pectoris is meant a condition in which a person, usually of middle age, is seized with an agonising pain in the region of the heart, and suffers from intense mental anxiety and a sense of impending dissolution. The term is now sometimes extended to include minor degrees of pain about the heart, met with in valvular heart disease, &c., but we will confine our remarks here to the major form. The cause is usually to be found in a diseased state of the commencement of the aorta (see ARTERIES, DISEASES OF, and ANEURISM), or of the coronary arteries which open off the commencement of the aorta to supply the heart itself. It is, however, a disease of the brain-worker rather than of the manual labourer, and men are affected much oftener than women. The actual exciting cause of an attack may be mental excitement in any form, but particularly anger; muscular exertion, especially if it be made in the face of a cold wind, which contracts the capillaries of the skin and so throws more work on the heart; or errors in diet causing gastric disorder.

Nothing is so characteristic and dramatic as a severe attack of angina pectoris. Seized suddenly or with but a moment's warning, the patient stands or sits transfixed with pain and fear. The pain often defies description, but sometimes it has been described afterwards as if the breast-bone were being doubled inwards; as if a sword were in the heart and being twisted about; or as if the chest were being crushed in a vice. The pain often extends down the arms, particularly the left one. The sense of impending death is so real that if the patient can find breath to speak, he nearly always expresses his belief that death is at hand. The look on the face is one of intense anxiety or horror, the colour is that of a corpse, while the brow becomes covered with a cold sweat. The pulse during an attack is small, and the arteries feel like pieces of whipcord. An attack usually lasts only a few minutes, although it may be more prolonged, and generally passes off accompanied by belching of quantities of gas from the stomach. Milder forms, in which the pain is not so severe as in the case described, are very common. The outlook in angina pectoris is always grave, for death may occur in any attack, and an attack may come on at any time. On the other hand, patients sometimes go long periods without an attack if they lead careful lives.

Treatment.—This must be divided into treatment of the paroxysm, and of the patient between the attacks, with the object of warding them off. For the actual seizure we have, luckily, in nitrite of amyl a remedy which in most cases gives almost instantaneous relief, and no person known to suffer from the disease should ever be without the little glass capsules containing from three to five drops of this substance. These are very thin, and break readily when squeezed in a handkerchief; the vapour is then inhaled. If this drug is not at hand, a drink of hot water containing some brandy may be given, since this not infrequently causes belching of gas, followed by some degree of relief to the patient. Between attacks the treatment is dietetic, hygienic, and medicinal. The diet should be just sufficient to maintain nutrition and no more. Sweet and fatty articles should be entirely avoided, alcoholic beverages should not be taken unless there is some special reason for them, and even then they must be well diluted. There is no objection to the diet being largely a meat one if the kidneys are fairly sound; the more so, as starchy foods are prone to cause the formation of gas in the stomach, which may upset the cardiac balance and precipitate an attack. As distension of the stomach is particularly to be avoided, it is often advisable to feed the patient with small quantities of food four or five times a day rather than to allow him to partake of three hearty meals a day. Hygienic measures consist in the avoidance of any chill to the skin. Flannel should be worn next to it both winter and summer. Sudden effort, such as running for a car or going upstairs quickly, or entering into any heated debate, must also be avoided. The medicinal treatment consists chiefly in the administration of iodides or nitrites, drugs which lower the arterial tension. Care must be taken that there is no straining at stool from overloading of the bowel; the bowels should be moved every day, by the use of some vegetable laxative, or salts, if necessary.

Anthracosis.—See under LUNGS, DISEASES OF.

Anthrax.—This disease, which is also known as "wool-sorter's disease" in man and "splenic fever" in animals, is rarely met with except amongst workers in wool and hides, but may occur in anyone who comes in contact with an infected animal. It usually takes the form of a small itchy pimple on the skin like a flea-bite; a small bleb or blister forms soon afterwards; this changes into a black spot, which soon becomes gangrenous. The disease is due to the entrance into the body of the anthrax bacillus; this generally occurs through a scratch in the skin of a person handling some part of an animal which has suffered from the malady. The commonest site is naturally, therefore, about the hand or forearm, but it is not uncommon about the face and neck. An internal form also occurs where the infection is swallowed or inhaled. The animals which suffer most from anthrax are cattle, goats, horses, and sheep. Wool and hides from Russia and Western Asia are notoriously the most dangerous.

Symptoms.—Some three days usually elapse after infection before any signs appear. The first symptom is a sense of itchiness, followed by a red spot resembling a flea-bite. This rapidly becomes redder and angry-looking, and at its summit a bleb or blister develops, filled with bloody serum. The surrounding skin is swollen and hard, and additional pimples and blebs appear as the infection spreads. The blebs become dry and crusty, and as they do the tissues underneath soften, the central parts becoming black and gangrenous. All this happens, as a rule, within one or two days; there is very little pain, but the neighbouring lymphatic glands, say in the elbow and armpit, become swollen. The natural course of the disease would then be for the whole arm to become greatly swollen, and the skin dotted with blebs; then general blood-poisoning, with fever, shiverings, sweats, diarrhœa, delirium, and death. The condition most likely to be confused with anthrax in the early stage is carbuncle. Anthrax is distinguished by the fact that there is no pus, or matter, in the swellings. Internal anthrax, which is fortunately still rarer, is exceedingly difficult to diagnose, as it varies so much in its severity. When inhaled, the symptoms are generally similar to those of pneumonia; when swallowed there is vomiting, diarrhœa, and great prostration. In neither case can an exact diagnosis be made except by the finding of the anthrax bacilli microscopically.

Prevention.—The incidence of the disease has been much diminished in this country by forbidding workmen to handle raw hides or infected animals if they have any superficial wounds, by the use of respirators to prevent the inhalation of dust laden with the bacilli, and by very strict regulations dealing with the disinfection of wool, hair, rags, hides, &c., particularly those coming from known bad localities. All animals suffering from anthrax must be killed and their carcases burned, or buried in quicklime.

Treatment.—The treatment of the external form consists in the complete destruction or removal of the primary sore. This is generally accomplished by excision, not only of the obviously infected part, but of the surrounding tissues, for at least an inch, as well. Since a favourable outlook depends almost entirely on the removal of the infection before the organisms have entered the blood, prompt treatment is essential, and should no skilled aid be available heroic measures must be taken and the sore well burnt out with a dull-red-hot iron, as soon as the diagnosis has become tolerably certain by the sore having become black in the centre. The patient's vitality should be maintained by good food and stimulants. An anti-anthrax serum is now also employed in conjunction with local measures, and otherwise desperate cases may be saved by its use. In internal anthrax it is the only treatment which offers any hope.

Antrum, Diseases of the.—See under NOSE, DISEASES OF.

Anus, Diseases of.—See RECTUM AND ANUS, DISEASES OF THE.

Aphasia.—By aphasia is meant any derangement of speech (including writing and reading as well as speaking) due to disturbance or disease affecting the speech centres in the brain. It is a symptom merely, and not a disease in itself. More or less permanent aphasias are caused by the bursting of a blood-vessel in the brain, or by the formation of a clot in a vessel of the brain (these come on suddenly); by the pressure of a tumour on, or the development of an abscess in the brain (these come on gradually). Temporary aphasia may follow an epileptic fit, over-indulgence in alcohol, &c. (See BRAIN, DISEASES OF.) In the brain there are at least three centres concerned with the speech mechanism: (1) An auditory speech centre, where spoken speech is heard and understood, *i.e.* translated into ideas. A destruction of this centre makes a person "word-deaf." He can still hear, but words convey no meaning to him—they are merely sounds. He may still be able to read perfectly and also to speak, but his speech is usually a jargon, because he has lost his word-hearing sense, and therefore the power of controlling his own spoken speech. (2) A visual speech centre, where written or printed speech is understood. Destruction of this makes the individual "word-blind." He can see all right, but writing or print conveys no meaning to him; he may be able to understand spoken speech quite correctly, and also to speak correctly, but he cannot read or write. (3) A motor speech centre or centres, concerned with the actual formation and production of spoken and written words. Destruction of this makes the person unable to speak or write, or reduces his power to the repetition of a few words or phrases, while he may still be able to understand spoken and written speech.

Such pure forms of partial aphasia are very rare, however; in most cases there is more or less interference with all the faculties of understanding and producing speech, and with the general intelligence as well. These speech centres are situated on both sides of the brain, but in the great majority of right-handed people the active or driving side is the left one. In left-handed people the reverse is the case. Hence in right-handed persons aphasia is a common accompaniment of a right-sided paralysis due to a hæmorrhage, &c. (apoplexy) on the left side of the brain. If the paralysis is on the left side the patient is not aphasic. In all cases with aphasia the advice of a physician should be obtained. The treatment depends on what the underlying condition is. (See BRAIN, DISEASES OF.) For the aphasic condition itself something, however, may be done, and that is—to attempt to train the other side of the brain to carry on the speech functions. To attain this end the same methods of education and training must be employed which are employed in the training and development of the speech faculties in the young child.

Apoplexy.—See BRAIN, DISEASES OF.

Appendicitis.—This is an inflammation of the vermiform appendix, a small, worm-like projection from the cæcum, or blind end of the commencement of the large intestine, and its outstanding features are pain in the lower part of the abdomen, on the right side, and, in all severe cases, at least, persistent vomiting.

The increasing frequency of this disease nowadays—it is so common as to be almost a fashion—is more apparent than real. In the days when surgeons hardly dared to open the abdomen—and that is not so very long ago—it probably occurred just as often, but it went by all sorts of names. One distinguished medical man of the present day tells how, in his youth, he had an attack of what he now is certain was appendicitis, but it was then diagnosed by an equally renowned physician of his day as "epilepsy of the solar plexus"!

Although so common, there is still considerable dispute as to the causation of the disease. Germs, both those constantly present in the bowel and also other pus-forming organisms, are the immediate cause of the inflammation, but what allows them at some particular moment to butt in and start appendicitis is the question. Constipation is such a common preceding condition that it often seems to have something to do with it, but constipation alone will not account for it. Foreign bodies, such as apple-pips and other fruit seeds, used to get most of the blame; such things are occasionally found in the appendix, but only in a very small proportion of cases. The appendix is an organ which in some of the lower animals, particularly the herbivora, is large and probably has important functions; in man it is to be looked upon as a useless vestige, with low vitality, and therefore a point of weakness, when, for any reason, the resisting powers of the body against organisms are lowered. Its only function, apparently, is to provide work for the surgeons. When an attack occurs pus forms within the tube of the appendix; in a mild case this is gradually absorbed and no great harm results, in more severe cases the pus bursts through and sets up, either general peritonitis, or forms a localised abscess in the structures around the appendix (iliac abscess). Appendicitis occurs at all ages, but is commonest between twenty and thirty, and affects men rather more than women.

Symptoms.—The pain is at first vaguely "in the abdomen," but it usually soon becomes localised to the right side, low down. It comes on in paroxysms of a sudden, colicky nature, but does not disappear entirely between times, and there is great tenderness to pressure over a point about midway between the navel and the prominent point of the haunchbone on the right side. The abdominal wall is kept rigid and board-like over the affected region, and the anxious flushed face and drawn-up knees demonstrate the physical agony of the patient. Sudden disappearance (temporary) of the pain is a bad sign, as it means either rupture or gangrene of the inflamed appendix, with a rapidly following wide spread of the inflammation. Vomiting is the next most constant symptom; sometimes it seems to usher in the attack, at other times it only comes on rather later, but generally persists till the attack is over. In mild cases it may not be present. The temperature is raised, but seldom to more than 102° F. The pulse is quick, but should not be more than 100 to 110 per minute; if quicker than this probably general peritonitis is present. After the malady has been present for some days, there is often a distinct swelling over the appendix region.

Treatment.—Appendicitis cases should always be seen by a surgeon, because, although probably many cases would recover without operation, one can seldom tell at the outset how any individual case is going to turn out. There are some cases where the symptoms are so bad from the very start as to leave no doubt as to the necessity of operation (*i.e.* removal of the inflamed appendix), and an operation gives almost the only hope of cure where an abscess has formed or peritonitis is present. But in the majority the following plan may be carried out. The patient is confined to bed. An ice-bag, *i.e.* chopped up pieces of ice in an india-rubber bag or tied-up piece of waterproof sheeting, is put over the appendix and kept there constantly. If ice cannot be obtained simple hot fomentations should be applied assiduously (pieces of flannel wrung dry out of boiling water, laid on the skin, and covered with waterproof material and a thick towel to keep in the heat). No purgatives are given, nor pain-relieving drugs, as the latter mask the indications for operation. No food is to be given and no drink taken by the mouth. If the patient complains greatly of thirst, a cupful of slightly warmed water may be injected with a syringe per rectum. If, under this treatment, the symptoms are not rapidly subsiding by the end of twenty-four hours, then it is probably better to have an operation. Operation is much safer at this stage than a day or so later. If the symptoms are distinctly abating the application of ice or fomentations or poultices should be continued for several days until the pain is entirely gone. The diet, when improving, should consist chiefly of milk for the first few days, then the patient may be gradually allowed back on to solid food. Great care must be taken to avoid constipation; if a day passes without a movement of the bowels a dose of castor oil should be given. In about a fortnight the patient will in all likelihood be fit for work again.

A condition of chronic appendicitis occurs in which the individual has at intervals attacks of a mild type. Seeing that the mortality of operation between attacks is almost nil, and that one never knows when the next attack is due, and whether it may not be a severe one, it is almost always advisable in these cases to have the appendix removed between attacks, and thus ensure complete freedom.

Arteries, Diseases of.—The arteries are not subject to many diseases, the only one with conspicuous features being aneurism. (See ANEURISM.) There is one other condition which must be referred to, namely *arterio-sclerosis* or *atheroma.* If one were asked to sum up in a word the characteristics of this condition, the answer would be "old age." It has been said that "a man is as old as his arteries," and it is perfectly true. Arterio-sclerosis or atheroma, which is a condition of thickening and rigidity of the walls of the arteries, either diffusely or in patches, is a natural accompaniment of old age. But just as tubes may be made of inferior rubber so are some persons born with poor arteries, and they become senile while yet young in years; and certain diseases, of which the chief are gout, syphilis, and alcoholism, bring on this condition in middle life. Over-eating, particularly of meat, also leads to premature thickening of the arteries. The same conditions are apt to produce chronic Bright's disease from thickening of the arteries of the kidneys. (See BRIGHT'S DISEASE.) One constant result of the thickening and rigidity of the arteries is a rise in the blood-pressure, and a consequent tendency for the vessels to burst, especially in the brain (apoplexy). The walls are also liable to give in places and aneurisms to form.

The condition can be recognised when, on feeling the pulse at the wrist, the artery can be rolled under one's finger like a pipe-stem or piece of thick cord. The symptoms are general debility, loss of appetite, shortness of breath, coldness of the hands and feet, but probably most striking are the mental changes from deficient circulation in the brain. The person becomes mentally feeble and usually very irritable and suspicious, subject to headache, or a sense of fulness in the head, giddiness, and noises in the ears, liable also to losses of memory and to turns in which he is incapable of speech. Such symptoms are sometimes regarded, and correctly so, as threatenings of an apoplectic stroke. From the causation of the condition it will be gathered that men suffer more than women from this degeneration of their arteries although the latter are by no means exempt.

Treatment.—This is largely preventive, and may be summed up in a sentence: "Be temperate and moderate in all things." Nothing can be done in the way of repairing the damaged vessels. A person with arterio-sclerosis actually present should follow the same rule of moderation with regard to eating, drinking, and exercise. The meals should be small and light, with little or no meat, and no alcoholic beverages. Exercise should be taken regularly, but no over-exertion or sudden violent efforts. It is wise to give up smoking, and cold baths are risky. Medicinally it is often advisable to take small doses of calomel—say 1 grain pills regularly every other night; this keeps the liver working well, and prevents constipation and straining at stool. Other drugs are used with the direct object of dilating the blood-vessels and keeping down the blood-pressure, but the ordering of these must be left to a medical man.

Arthritis.—See Joints, Diseases of, and also Rheumatism.

Ascites.—See Dropsy.

Asthma.—This disease has for its outstanding features the occurrence of attacks of great difficulty in breathing, and the breathing is extraordinarily wheezy; between attacks the affected person is usually quite well as far as the breathing is concerned.

The disease runs very much in families, especially in those of a gouty or nervous stock. It may come on at any age, but often begins in childhood and lasts until old age; it is commoner in men than in women. One of the striking peculiarities of the disease is the number and queer nature of the circumstances which may bring on an attack. No two persons are alike in this respect; what will induce an attack in one may even relieve it in another. Amongst the exciting causes local atmospheric conditions are perhaps the most important. A person may be free in the city and invariably suffer when he goes to the country, or into some special district. Breathing the air of some dusty room may bring on an attack. The smell of certain flowers, or of some animals, may at once cause an outbreak; in this respect asthma is very like hay-fever. Fright or any violent emotion may bring on a paroxysm. Diet has an important influence; the taking of certain articles of food, or overloading of the stomach with anything, may induce attacks in those at all subject to them. Lastly, not a few cases are associated with affections of the nose, such as polypi. Attacks resembling asthma also occur from heart disease or Bright's disease, but these are really quite different in their nature, and will be referred to under Heart Disease and Uræmia.

The attacks come on most often at night, the patient wakening with a sense of great oppression in the chest and gasping for breath. The inspirations are short and quick, the expirations prolonged and wheezy. He becomes somewhat livid in colour, beads of sweat appear on the face, and the expression is anxious. After some time, varying from minutes to hours, the attack passes off, and with a fit of coughing the patient sinks exhausted to sleep. A second attack is very likely to occur the following night, while during the day the patient may be fairly comfortable.

The outlook is good in children, in whom the disease very often ceases about fourteen or fifteen; when it comes on in adults, it seldom can be got rid of, and always throws some strain on the right side of the heart, weakening it. People never die of asthma, however. The only cases in which complete cure can be looked for, are those due to disease in the nose; if that be removed the asthma may quite disappear.

Treatment.—If at all possible, asthmatics should live in a climate which suits them. No rules can be laid down to guide them in their search for this, as every case has its own peculiarities. Dry, warm climates suit many, but by no means all. The air of cities often suits better than that of the country; indeed the awful atmosphere of the old underground railway in London used to be a veritable home of refuge for many. Experience teaches most sufferers that no heavy meal must be taken towards bedtime. Starchy and farinaceous foods should be taken in moderation, and coffee will be found a more suitable drink than tea. The actual attack demands prompt treatment, and remedies are required which will relieve the spasm of the muscles surrounding the bronchial tubes, which causes the difficulty in breathing. Here again there are great individual differences, and sometimes remedy after remedy has to be tried until one is found to suit the particular case. There are on the market a host of patent "certain cures" for asthma, but their number alone is sufficient denial of the certainty of the cure. A word of warning about some of them, which contain powerful but dangerous drugs, such as morphine and atropine, or cocaine; although efficacious at first, tolerance is soon acquired towards them, bigger and bigger doses are needed, and either a drug habit becomes established, or fatal results follow from over-dosage. These dangerous "cures" are mostly, if not all, in the form of sprays, and persons suffering from asthma are strongly warned against them. Exorbitant prices are charged for most of them, and if such drugs are really needful to get relief, they can be obtained at a tithe of the cost on a doctor's prescription, as their composition is really quite well known; there is no marvellous secret about them. The same warnings do not apply against the type of cure which consists of a powder which has to be burnt and the smoke thereof inhaled. Some one or other of these will generally be found to give relief, and may be used with perfect safety. In persons who are not habitual smokers the inhalation of the smoke of an ordinary cigarette is sometimes sufficient to cut short an attack. The smoke of brown paper soaked in a strong solution of nitre (and dried) is a common remedy; it must be used freely, so as to make the air of the room dense with its fumes. The following prescription contains most of the substances found in the various proprietary medicines; it will be found to act well in many cases, and has the advantage of being much cheaper when made up by a chemist than when bought as a patent medicine.

℞ Datura tatula	6 drachms
Stramonium leaves	6 drachms
Cannabis indica	6 drachms
Lobelia inflata	6 drachms
Potassium nitrate	1 ounce
Eucalyptus oil	½ drachm

Mix. Half a teaspoonful to be burnt for each inhalation.

The remedies which relieve sick headaches often act also like a charm in the case of asthma. (See Migraine.) Lastly, it should be mentioned that the induction of vomiting, either by tickling the back of the throat or by the use of an emetic, such as salt and water, will not infrequently give instantaneous relief.

To lessen the tendency to attacks the drugs most usually employed are iodide of potassium and arsenic, either separately or in combination, but the ordering of these must be left for the doctor. If a definite cause or causes which bring on attacks can be found, the removal of these may be followed by the happiest results: the nose and mouth should always be carefully overhauled as possible seats of the trouble. It must also be remembered that asthma is sometimes a manifestation of gout, and by treating the gout the asthma is also relieved. In cases complicated by frequent attacks of bronchitis, "vaccine" treatment for the latter has in recent years given some excellent results.

Astigmatism.—See under Eye, Diseases of the.

Ataxia.—See Locomotor Ataxia.

Backache.—Aching, stiffness, pain, or tenderness of the back is a symptom met with in a number of different diseases. Thus severe aching in the back is an early feature of smallpox, and, along with general aching, is usually very marked in influenza and in dengue, a tropical fever similar to influenza. In all these conditions the temperature is raised; for further details they must be referred to individually. Aching and tenderness on pressure is usually present along the whole spine in meningitis, also a fever with rise of temperature (in this case there is generally marked stiffness at the back of the neck); in some diseases of the spinal cord; in nervous prostration or exhaustion (neurasthenia); and sometimes in hysteria; also in rheumatism, acute or chronic. Pain in the chest portion of the back may be due to spinal disease, to the pressure of an aneurism of the aorta, or of a tumour inside the chest, or it may be pain referred from the stomach or liver. Pain in the back at the level of the waist may also be due to spinal disease, or it may be a symptom of Bright's disease of the kidneys, especially the acute form; or, a little lower down, in women is commonly a referred pain from some displacement or diseased condition of the womb. Many people fear that they have kidney disease when they have pain in the small of the back: most of them are really suffering from what is after all by far the commonest back trouble—viz. lumbago. We will refer to this here in more detail. For a consideration of the other conditions mentioned as causing backache, the reader must look up the diseases under their own headings.

Lumbago.—By this is meant pain in the muscles of the small of the back, which is always made worse on stooping—*i.e.* on stretching the muscles. In severe cases the pain may be constant, in milder forms it is only present on movement, but it can be so bad as to make the sufferer afraid to move. The muscles are tender on pressure. The condition is commonest in middle-aged persons; attacks often come on quite suddenly, and may last a few days, or even weeks. The condition is supposed to be a rheumatism of the muscles, but it does not seem to be the same disease as joint rheumatism. It comes on from exposure to cold and damp, and from unaccustomed strain or exercise of these muscles—*e.g.* rowing, or lifting heavy weights.

Treatment.—This is, of course, the treatment of the disease causing the pain. For lumbago the patient should go to bed and take a good dose of an alkaline purge, such as the effervescent citrate of magnesia (a tablespoonful). If possessed of a battery and coil, the application of a faradic current (the current from the shocking coil) to the back will often give immediate relief—too often, however, only temporarily. If the pain is very bad, a belladonna plaster about four inches square should be applied; this soothes, but does not cure. A more curative measure, to be employed whenever the patient can stand the pain, is gentle rubbing with turpentine liniment, or the application of a turpentine stupe (a piece of flannel wrung out of boiling water, and *a few drops* of turpentine then sprinkled over it, applied and kept warm by being well covered over). The old-fashioned plan of ironing the back, with a thick layer of brown paper between the iron and the back, may also be tried. Frequent sufferers are advised to wear a belt of thick but loose flannel round the waist; and an occasional visit to a spa, such as Bath, Buxton, or Harrogate, for the baths is recommended.

Baldness is so common that it has come to be looked upon as almost a natural sign of old age, or, if it begins to appear while the individual is yet young, it is said to be "hereditary," and may even be looked upon as a sign of great learning on the part of the "sufferer," and be worth quite a tidy sum a year to him. It has also been attributed to the wearing of hard hats with tight brims, which prevent the blood from circulating properly in the scalp. In fact, there is more nonsense talked about baldness, and more money made by the venders of nostrums for its cure, than is the case probably with any other ailment to which human flesh is heir.

There are, it is true, certain serious diseases which may cause falling out of the hair, or even more or less complete baldness—viz. syphilis, myxœdema, some acute fevers, such as scarlet fever, great mental strain, &c.—but in these cases the thinness of the hair will usually improve with remedies proper to the disease causing it. Baldness may also appear in a patchy form. This will be referred to later.

Premature baldness, that gradual thinning of the hair which is so very much more common in young men than in the opposite sex, is in ninety-nine cases out of a hundred due to *dandruff of the scalp*. Now dandruff is neither hereditary, nor a sign of special wisdom or sanctity in the possessor of it, nor is it due to the wearing of tight bowler hats. A sign of civilisation it may be, but not one to be proud of, for dandruff or seborrhœa is an inflammation of the skin, due to special microbes, very likely the same as those which cause acne. It occurs in some persons because they do not wash their scalps often enough to keep them clean; it is thought to be hereditary because, once in a family, the other members are almost certain to be infected with the disease; it is commoner in men because of their shorter hair and their more frequent visits to the barber, conditions which allow of easy infection of the roots of the hair. Every barber's brushes may be looked upon as invariably infected and as centres for spreading dandruff, no matter how "antiseptic" he may say his methods are.

Although dandruff has been stated to be an inflammation of the scalp, the ordinary signs of inflammation are not present; there is no redness, and there is no pain, at most only a slight itchiness of the scalp. Two forms may be distinguished: (1) A dry and very scaly form. In this the natural oil of the hair has been destroyed by the bacteria, and thinning of the hair proceeds apace, until all but a fringe at the sides and back is lost. (2) A form with excessive oily secretion, which anchors the scales, so that they only become evident on scratching the scalp with the finger-nail. In these the hair is not lost so much, but it turns early grey.

Treatment.—The prospects of a cure for baldness are not always very good. Nothing short of a miracle will make hair grow on a scalp like a billiard-ball, where all the hair-roots are destroyed; and even in less advanced cases such perseverance is required that many find it too much bother, and prefer the disease to the cure. Many forms of "hair-drill" and multitudes of applications may be tried, but all require months of assiduous use to eradicate dandruff from the scalp, and even then one can only expect to save the hair which is left, or, at the most, to get a slight new growth. We will only mention one mode of treatment which we believe will, *with perseverance*, give as good results as any, in most cases. The scurf must firstly be removed from the scalp by thorough washing with soap, preferably soap spirit (green soap or soft soap 2 parts, spirits of wine 1 part). The head should be washed with this every other day, or even daily, until the hair ceases to come out, taking care to remove the soap completely with repeated fresh waters. Then rub in daily—and see that it is really rubbed in, not merely plastered over the hair (spend ten minutes rubbing it in with the finger-tips)—an ointment composed of salicylic acid 25 grains, vaseline 1 ounce. If this, as a greasy application, is objected to—and it probably will be, by ladies especially—the following lotion makes a pleasant substitute:

℞ Salicylic acid	3 drachms
Castor oil	2 to 6 fluid drachms
Attar of roses	10 drops
Spirits of wine	to 6 ounces

This is not greasy, as the oil is completely dissolved in the spirits. The larger amount of oil should be employed if the hair is dry, the smaller if not. Ladies will find it best to apply by using a spray with a long nozzle. Whether this preparation be employed, or one of the many advertised remedies, this point must again be insisted upon, that unless it be well rubbed in so as to reach the roots of the hair, and used for months, the dandruff will not be got rid of, nor the progressing baldness stopped. There is no rapid, royal road to a cure.

Baldness in sharply defined patches may result from ringworm, from favus, or from the disease called alopecia areata. For these, see under SKIN DISEASES.

Bandy-legs.—See DEFORMITIES.

Barber's Itch.—See under SKIN DISEASES.

Bed-sores.—See Nursing Section of this book.

Beri-beri.—A tropical disease, sometimes known by the Japanese name of *kakke*. The chief symptoms are paralysis, dropsy, palpitation, and breathlessness. This disease is met with in almost all tropical and sub-tropical countries, but especially in the Malay Peninsula and East Indies. Conditions of overcrowding seem to have a great deal to do with its causation; coolie-camps, ships, jails, barracks, &c., are the places where it may be expected. Another important factor is diet, and most authorities lay stress on rice of poor or diseased quality as being the essential cause of the disease. The symptoms are due to an inflammation of the nerves all over the body (see NEURITIS). Cases vary greatly in their severity. The mildest have only some pain, weakness, and numbness in the legs, with perhaps a little palpitation; these usually recover in a few months. More severe cases become feverish and weak, their legs become quite paralysed and wasted, and there is loss of sensation in patches of skin all over the body; this is called "dry beri-beri." In the "wet" form there is in addition dropsy, beginning in the feet and spreading upwards, and dilatation of the heart, showing itself in pain over the heart, palpitation, and breathlessness. In the severest forms, which generally attack strong, vigorous men, all these symptoms develop in the course of a few days, and the patient almost invariably dies in agony.

Treatment.—Medical aid should always be obtained. We would just indicate that it is desirable, whenever possible, to remove the invalid at once to high ground or to put him on board ship. He should be put on a liberal diet, containing plenty of meat and fats. For the dropsy and palpitation digitalis is the remedy usually employed, but it is a drug whose use needs constant skilled supervision. The paralyses are to be treated in the same way as those resulting from any other form of neuritis (which see). It may take a year, or even longer, for complete recovery.

Bilharzia.—See Parasites.

Biliousness, or Bilious Headache.—This term is used a little vaguely, and may mean either the sickness and headache which are due to acute gastric catarrh, resulting from some indiscretion in diet, or the exceedingly severe headache and vomiting which occur in the condition known as migraine. (See Stomach, Diseases of, and Migraine.)

Birth-marks.—These are congenital malformations in the skin, which, although present, may not always be visible at the time of birth. There is very little real evidence that they are due to some strong mental impression made on the mother during pregnancy. The two chief varieties are moles and nævi. *Moles* are raised spots on the skin, but without the cauliflower-like surface of a wart; they are usually more or less dark in colour, from the presence of pigment, and hairy. If not in a situation causing disfigurement they are better left alone. If on any part where they are liable to much irritation, or if they are near the corner of the eye, nose, or mouth, they are better removed, because under these circumstances they are apt to become cancerous. The knife is the only certain method of removal. *Nævi* are dilated blood-vessels in the skin, and may look like a spider's web with the spider in the centre, or they may take the form of the familiar "port-wine" stain. Both forms are seen most commonly on the face, and may be very disfiguring. The spider nævi are easily cured by electrolysis. The port-wine stains are not so readily removed, but good results sometimes follow the use of X-rays or the application of carbonic acid snow.

Black-water Fever.—This condition, characterised by the urine being dark red or black from the presence of blood, is a complication of that form of malaria known as æstivo-autumnal, or remittent, fever. It is only met with where this kind of malaria is prevalent, chiefly in certain of the Southern United States, in the West Indies, in Greece, and in some parts of Central Africa. The symptoms associated with the development of bloody urine are just those of an attack of severe remittent malarial fever (fever, pains all over the body, bilious vomiting, &c.). (See Malaria.) Mild cases recover in a day or two. Severe cases are apt to have recurrences and relapses even after leaving the malarial district.

Treatment.—Quinine, the specific for malaria, is useless; it may even precipitate an attack. Water should be drunk freely during the attacks. If it cannot be kept down, owing to the vomiting, then half a pint of warm water should be given as a rectal injection every hour. Absolute rest in bed is essential. Small doses of alcohol (say half a wineglassful of whisky, slightly diluted and iced, three or four times a day) will be required after the second day. The best medicine during the attack is a small wineglassful every hour of a mixture composed of bicarbonate of soda 150 grains, corrosive sublimate one-third of a grain, dissolved in a quart of water. Return to a malarious country is not advisable in a person who has had black-water fever.

Bladder, Diseases of the.—The urinary bladder, being a passive organ, its function being merely to store the urine which is being excreted continuously by the kidneys until there is a considerable quantity and it is convenient to get rid of it, is not subject to many diseases. It will be convenient to discuss along with the bladder the prostate gland, a gland situated round the neck of the bladder, but occurring only in the male sex. Owing to the position of the bladder in the lower part of the abdomen (in the pelvis, behind the pubic bones), symptoms set up in it are sometimes attributed to the bowels; but the attention is usually drawn to the bladder by the observance of something wrong with the appearance of the urine, or by some trouble connected with the making of water.

Rupture of the Bladder.—This may be due to a crush or blow, especially over the full bladder, or it may happen through simple over-distension. The symptoms are shock, burning pain in the lower part of the abdomen, constant desire to make water, but, as a rule, nothing is passed, except perhaps a little blood. Immediate surgical treatment is required, or the condition is inevitably fatal.

Inflammation of the Bladder, or Cystitis.—(1) Acute cystitis is characterised by pain in the fork and lower part of the abdomen, frequent painful efforts to pass water, but little is passed at a time, and it generally contains blood; there is some fever also. This form may be due to cold in gouty subjects; in fact, there are some people who often "catch cold" in their bladders instead of in their heads or chests. Recovery may be expected in a short time, as a rule. A much severer form may result from the extension upwards of a gonorrhœa from the urethra. Treatment consists in rest in bed, hot hip-baths twice daily, hot fomentations over the bladder while in bed, a purely fluid diet, and plenty of barley water to drink. Various sedative drugs are employed to allay the irritation in the bladder, but the ordering of these is rather beyond the scope of this work. (2) Chronic cystitis is much more common than the acute variety. The symptoms are those of irritability of the bladder, the patient constantly desiring to pass water, and having to rise several times at night for that purpose. The urine becomes thick and muddy-looking, and usually ammoniacal or foul-smelling. There is in most cases but little pain. If it lasts long the patient's general health becomes impaired, and the inflammation of the bladder may extend upwards to the kidneys. The usual cause is some irritation of the wall of the bladder, as from the presence of a stone, or a tumour, or tubercular disease. The latter form is very difficult to treat. It may also be due to the retention and decomposition of urine, especially if associated with obstruction to the outflow, as by a stricture (see Penis, Diseases of) or enlarged prostate. It is also apt to come on when there has been any injury or disease involving the spine or spinal cord.

Treatment.—If any stone or stricture is present, treatment is naturally directed towards that. In almost all cases great benefit will result from washing out the bladder. A patient can be taught how to do this himself in some cases, but it requires actual demonstration of how to do it. A milk diet is best; tea and coffee should be avoided altogether, and alcohol only taken well diluted if necessary for some other reason. Various drugs with an antiseptic action are often employed to lessen the decomposition of the urine.

Tumours of the Bladder.—These are apt to bring about the frequent passage of large quantities of bright-red blood in the urine. A certain diagnosis can only be made by the finding of portions of the tumour in the urine, or by the examination of the interior of the bladder with instruments. The only treatment is operative.

Stone in the Bladder.—Commonest by far in the male sex, especially in children, and again in elderly men. The chief symptom is pain, felt immediately after passing water, and noticed especially at the end of the penis. There is occasionally some bleeding, the flow of the urine sometimes suddenly ceases, and any jolting is likely to cause pain in the bladder. There may be a history of "gravel" having been passed for a long time before, on the cessation of which the symptoms of stone commenced. The symptoms of inflammation in the bladder are almost certain to come on if the stone has been there any length of time. Stones may be of any size up to that of a goose egg, and in composition the stone, or stones (for there may be several, or many of small size), may be formed of (1) uric acid, in persons of rheumatic or gouty tendencies; (2) oxalic acid, often associated with chronic dyspepsia; (3) phosphates, where there has been long-standing inflammation of the bladder and decomposition of the urine. The diagnosis is usually clinched by the passage of an instrument, when the stone can be felt.

Treatment.—In persons of rheumatic or gouty tendencies the formation of stone may be warded off by counteracting the acidity of the blood and urine. The diet should contain very little meat; large quantities of liquid should be drunk, either plain water, or alkaline mineral waters such as Ems, Vichy, or Contrexéville, lime juice, lemon squash, or effervescent drinks containing tartaric acid and bicarbonate of soda. Green vegetables should also be taken freely. Those cases with a tendency to oxalic acid precipitation usually need bitter tonics such as Easton's syrup (one-half to one teaspoonful before meals), a diminution in the bread and starchy foods of the dietary, and careful avoidance of rhubarb and tomatoes, which contain oxalates. (See Dyspepsia.) If the stone has already formed, the same regimen should be followed in attempting to dissolve it; but if the symptoms are at all bad, removal of the stone by operation will be necessary.

Enlargement of the Prostate.—This occurs in men over fifty, and leads to retention of urine and decomposition inside the bladder, signs of irritation, and frequent desire to pass water. The stream comes out with less force, and straining often hinders rather than assists. The bladder is very apt to become over-distended, to lose tone, and then constant dribbling away of urine sets in and makes life miserable. Much may be done to prevent this train of symptoms by seeing that the bladder is always quite emptied, so that no residual urine remains to distend the bladder and to decompose in it. The patient should complete the emptying of the bladder in the attitude of being on his hands and knees. In this position the enlarged gland does not obstruct the outflow at the neck of the bladder nearly so much. In more severe cases removal of the prostate is now carried out with great success.

We have next to deal with a group of conditions where there is no actual disease of the bladder, but where there is yet something wrong with the act of making water.

Incontinence of Urine—*i.e.* loss of control and involuntary dribbling away of urine. There are two forms of this: (1) An active form, occurring in children, particularly boys. The affection is most obvious at night; they constantly wet the bed, and the condition may persist till adult life. Such children should always be examined for a tight foreskin, and if it be present they should be circumcised. Five drops of tincture of belladonna in a little water may be given at night to lessen the irritability of the urinary organs, and the child may be waked from sleep at regular intervals in order to pass water, so as to break him of the bad habit. (2) A passive form, where the nervous mechanism of the bladder is destroyed. This form is practically always accompanied by paralysis of the lower limbs. Nothing can be done beyond the application of a suitable urinal or apparatus to catch the urine which is constantly dribbling away.

Retention of Urine.—When a person is unable to expel the contents of the bladder, so that it becomes distended, retention is said to be present. It results from a number of causes, but as it always gives rise to much pain and discomfort, and if left long untreated will give rise to long-standing, if not serious, mischief, the doctor should be sent for at once. The patient may in the meantime be put into a hot bath, which will sometimes give relief.

Abnormal Appearances of the Urine.—It will be convenient also to mention here some abnormal appearances of the urine, which, although not necessarily due to disease of the bladder, might be thought to be so. Reference will merely be made to the various conditions which may be giving rise to the unusual appearance; these must then be consulted further.

Blood, or Blood-colouring Matter, in the Urine.—This gives the urine a red, brown, or smoky colour. It may be present in a severe attack of almost any fever or infectious disease, especially blackwater fever, in acute Bright's disease, and in various kidney diseases, in diseases of the bladder, including the presence of the tropical parasitic worm bilharzia. Various poisons being excreted in the urine may, by their irritation, cause blood to be present. It also occurs paroxysmally along with Raynaud's disease, a condition usually brought on by exposure to cold, in which a person's hands and feet become very blue and very painful.

Pus, or Matter, in the Urine.—From the presence of pus the urine is generally thick and turbid as it is passed, and often very strong smelling. This is indicative of cystitis, or inflammation of the bladder. Sometimes the urine as a whole may be clear, the pus only being noticed, if the urine is allowed to stand, as a white heavy deposit at the bottom. This usually means that there is kidney disease of some sort.

Bile in the Urine.—This gives the urine a smoky greenish colour. It is only present along with jaundice.

Deposits in the Urine on Standing.—A very common deposit is that of *urates*, which appears as a salmon-pink layer—"brick-dust" deposit—at the bottom. This not infrequently alarms people when they happen to notice it, but in most cases it does not mean any disease, but merely that the urine has become a little more concentrated than usual, perhaps because less fluid has been taken, or because the person has been perspiring freely. It may mean too much eating and drinking with insufficient exercise, especially if constant. *Uric acid* may appear, either alone or with urates, looking like dark-red grains of cayenne pepper. This does mean disease—viz. too much acidity and gouty tendencies, and, if not rectified, a risk of gravel and stone. *Phosphates*, which take the form of a white, loose, fluffy deposit, usually indicate more or less nervous exhaustion, and treatment on the lines of that laid down for neurasthenia. *Mucus*, which looks like a thin cotton-wool cloud, is present normally.

Increased amount of urine may mean increased consumption of food or drink, exposure to cold, diabetes, or chronic Bright's disease.

Diminished amount of urine occurs when little fluid is being drunk, from warmth and sweating, in fevers, and sometimes in advanced forms of heart disease and some cases of Bright's disease. It may also be due to obstruction of the urinary passages, as from a stone in the kidney (renal calculus).

Bleeders.—See HÆMOPHILIA.

Blindness.—See EYE, DISEASES OF THE.

Blood, Diseases of the.—Seeing that the blood circulates through all the body and bathes every tissue, supplying nourishment and carrying off waste products for excretion, it will readily be understood that in diseases of almost every kind diseased products may enter the blood, and they in their turn upset the workings of other organs, and may thus produce many aches and pains and a condition of general ill-health. Such a state of affairs, when the original site or cause of the trouble is not very evident, is often spoken of as "impurity of the blood" or "poor quality of the blood," and correctly so, although it is hardly fair to put the blame on the blood. In a great many of these cases the trouble is in the bowels. Instead of being emptied regularly every day, waste products are allowed to accumulate there, and there is constant reabsorption of these back into the circulation, where they bring a whole host of symptoms in their train. This explains the wonder-working powers of so many patent medicines, which contain simply some purgative or aperient.

There are, however, diseases more immediately connected with the blood, some with the blood corpuscles, others with the blood plasma (the fluid in which the corpuscles float), or with the blood as a whole. The chief conditions affecting the corpuscles are *anæmia* or *bloodlessness* (see ANÆMIA), and *leucocythæmia*. There are two types of this disease, although it is not a common one and its cause is unknown: (1) Occurring in young people, and often coming on pretty quickly, in which the main symptom is enlargement of groups of glands in the neck, the armpit, and the groin, with great weakness and sometimes hæmorrhages under the skin, in the gums, &c. The diagnosis can only be made with certainty by examination of the blood revealing a great increase in the number of the small white corpuscles, or lymphocytes. This form may be fatal in a few weeks, and always demands professional treatment. (2) Coming on insidiously in middle life. The symptoms are breathlessness, palpitation, hæmorrhages, especially bleeding from the nose, often diarrhœa and feverish attacks, and enlargement of the spleen, giving rise to a painful swelling in the upper part of the abdomen on the left side. The microscope here shows an increase in the number of the large white corpuscles of the blood. This form is much more amenable to treatment, the use of arsenic (for which a doctor's prescription must be obtained) and of X-rays being followed by great improvement, although perfect cure is not often obtained. The patient's weakness compels him to lead a quiet life, otherwise there are no special rules to be observed.

Other diseases of the blood, in which the chief symptoms are debility, breathlessness, and the occurrence of bleeding, under the skin, from the nose, gums, bowels, &c., either spontaneously or from the slightest injury, will be found under the headings HÆMOPHILIA, PURPURA, and SCURVY.

Bloodlessness.—See ANÆMIA.

Blood-poisoning.—This may follow in any weakly person (diabetics and alcoholics especially), or even in strong persons from a very virulent bacterial infection of any wound or acutely inflamed area. Women are liable to a peculiarly severe form after delivery—puerperal fever. The symptoms are high temperature, sweating, rigors (shivering fits), delirium, pains all over the body, and sometimes the formation of abscesses at many different points. The condition is always a serious one, and may be fatal, although modern antiseptic surgery has immensely reduced the frequency of blood-poisoning.

Treatment.—Even after the development of blood-poisoning the chief attention will still be directed to the original source of the mischief—the factory whence the poisons are being poured into the system. Such measures as opening of abscesses, antiseptic baths, or even amputations are required. The patient needs good dieting to keep up his strength—strong soups, beef extracts, eggs, plasmon, and the like. Alcohol is of great value, and may be given freely (say up to half a pint of whisky, spread over the day, and not too much diluted). Of drugs probably quinine is the most useful in allaying the fever. Give a single dose of 30 grains of sulphate of quinine. If bought in tablet form, as it probably will be, powder it and give it suspended in milk. The temperature should fall in about a couple of hours. The dose may be repeated in six or eight hours. Serum treatment is now employed in some suitable cases.

Boils.—Boils begin as hard, smooth swellings lying rather deep in the skin, and only itchy at first. They grow pretty quickly, developing a head, becoming conical shaped, and are throbbing and painful, while the skin all round becomes red. After about five days the top breaks, a little matter escapes, followed in another day or so by the solid central core coming away. While most often found in those who are run down, they are frequently seen in persons of full vigour. A local infection of a hair follicle is a *sine qua non* in the formation of a boil; those occurring at the back of the neck being often due to contamination from some particularly comfortable but dirty old jacket; those on the seat, to the irritation of rowing or riding, or to lack of absolute cleanliness. It must be remembered that diabetes is a cause which leads to the common occurrence of boils. A carbuncle is sometimes regarded as a collection of boils close together. (See CARBUNCLE.)

Treatment.—Whatever is done, a poultice should not be applied; there is no better way of raising a crop of boils all round the original one. The best plan is to get a piece of Unna's mercury and carbolic plaster, cut out and apply a piece rather larger than the boil, with a small opening which should be over the centre of the inflamed area. Ordinary sticking plaster may be used if this cannot be obtained. The boil should also be protected from pressure and rubbing either by a pad of lint or by a small celluloid shield. If the pain is very great, as it may be if the boil be situated on the ear, nose, or any part where the skin is tight and will not stretch much, it is advisable to have the boil opened; this relieves the pain, although it does not in any way hasten the process of healing. For boils about the face it is advisable to see a doctor in any case, as they often have to be opened on account of the risk of boils in that situation leading to inflammation inside the head. General treatment consists in free daily evacuation of the bowels, preferably by the use of a Seidlitz powder in the morning; the administration of a tonic such as Fellow's or Easton's syrup; and, if it can be obtained, a tumblerful of fresh yeast every morning from the top of the brewer's fermenting tun.

Bone, Diseases of.—*Acute Inflammation.*—This disease usually occurs in children. It begins abruptly with shivering fits, followed by high fever and severe pain in the limb, the bone being excruciatingly tender to the touch. The limb soon becomes swollen, brawny, and red. It may at first be mistaken for an acute attack of rheumatism, but this mistake will not be made if one remembers that rheumatism affects the joints, while in this condition it is the bone between the joints that is affected. The patients who get this disease are always in a state of depressed general health; not infrequently they have just recovered from some other acute illness. A slight injury, such as a knock or kick, which under other circumstances would do but little harm, may determine the starting-point of the inflammation; but as the skin is not usually broken, there must be infective germs circulating in the blood to set it up. If left untreated, or if not seen early enough, general blood-poisoning is very apt to come on, or, at the best, great destruction of bone and impairment of the subsequent use of the limb follows. The limb should be rested, hot fomentations or poultices applied, and a surgeon sent for. Very mild cases may recover with these applications, but most require to be opened like any other abscess, or amputation of the limb may even be necessary. If the acute stage be got safely over, the prospects of recovery and of repair are good, even if large portions of the bone have been destroyed.

Chronic Inflammation.—In this condition there is deep aching pain in the limb, worse at night, with perhaps tenderness over some particular spot. On examination the bone is felt to be thickened, and its surface more or less nodular. Chronic inflammation is perhaps commonest near the ends of some of the long bones, especially just below the knee. The condition may be due to injury or to syphilis. As it is not always easy to determine the cause, the treatment recommended is to paint the part with iodine and give it complete rest. If relief is not obtained thereby, operation or some other measure may be required. A special form of chronic inflammation about which a little more must be said is *tubercular disease in bone.* This occurs usually in weakly children or young persons with a tubercular inheritance. The commonest situations are: (1) the small bones about the wrist and ankle, where the joints are certain to be affected as well (see TUBERCULOSIS, and JOINTS, DISEASES OF); (2) the ends of the long bones of the limbs, when again the joint is very liable to become involved; (3) in the vertebræ, where it may lead to curvature or to a chronic abscess. (For the special features of this form see SPINE, DISEASES OF THE.) In the first two situations the bone becomes slowly enlarged and painful, the pain being, however, slight in amount, though generally worse at night. This goes on for some weeks or months, until finally one spot rapidly increases in size, becoming red and tender, and finally an abscess forms, which bursts or is opened, leaving a channel leading down into the bone or joint, and which may go on discharging for a long time. The treatment is similar to that of tubercular disease generally. (See TUBERCULOSIS and CHRONIC ABSCESS.) Fresh air, good feeding, complete rest to the part by means of plaster of Paris in the early stages, and removal of the tuberculous tissue by operation if the disease persists, may be mentioned as a summary of the treatment.

Tumours of Bone.—Small cartilaginous tumours arise on bones sometimes, especially under the nails, near the knuckles, or about the arch of the foot. They grow slowly, and may give rise to considerable annoyance from their size, but not to much pain except when growing under the nails. Ivory-hard tumours may grow from the bones of the skull. The commonest, and also the most serious tumour, is that form of malignant growth known as sarcoma. It arises chiefly on the larger bones, in comparatively young people, giving rise to very little in the way of symptoms at first beyond the hard swelling. The bone becomes brittle and readily breaks. If untreated, it is often fatal from secondary growths throughout the body, just as in the case of a cancer. The only treatment for tumours of bone is removal by operation, which in the case of sarcoma must be done wide of the tumour, and the earlier it is performed the better.

Rickets.—A disease of children, usually appearing within the first three years of life, due to improper feeding, and manifesting itself chiefly in the bones, which become soft and undergo various deformities. (See RICKETS.)

Osteomalacia.—A disease in which there is also great softening of the bones, but it occurs in adults, chiefly in women, and then usually in connection with pregnancy. It is very rare in this country, being met with principally in Italy and Southern Russia, amongst the poorer ill-fed classes. We need merely say that it will never occur in persons who have a sufficiency of good food.

Acromegaly.—A disease in which there is great enlargement of the bones of the head, hands, and feet. (See ACROMEGALY.)

Bowels, Diseases of.—See INTESTINES, DISEASES OF.

Bow-legs.—See DEFORMITIES.

Brain, Diseases of the.—The brain is the seat of the will, of the emotions, and of the intellectual functions; it originates and controls movements of every sort; the outside world is appreciated in it through the stimuli which reach it by the nerves from the eye, ear, skin, &c., and are there translated into sensations of sight, hearing, taste, smell, touch, pain, heat, &c.; it controls the power of speech, and governs many of the processes most essential to life—*e.g.* those of respiration, swallowing, beating of the heart, &c. Injury or disease of the brain may therefore result in disturbances of many different kinds—disorders of conduct, of intellect, paralyses, affections of the senses or of speech, or disordered working of practically any organ in the body. In some forms of brain affection the disease is of a gross nature which can be easily recognised; in others, particularly in those forms where the symptoms are chiefly mental rather than physical, the nature of the disease has so far defied detection—we know it only through its symptoms. In this section we will deal only with a group of those conditions more exclusively connected with the brain, in which the symptoms are mainly physical, and in which there is, in most cases, some gross affection of the brain substance. Other conditions will be dealt with under MENTAL DISEASES, NERVOUS DISEASES, and under such headings as APHASIA, EPILEPSY, HEADACHE, MENINGITIS, PARALYSIS.

Abscess.—Abscess of the brain may result as a sequel to fractures of the skull; to wounds of the scalp which have not been kept clean; or, most commonly of all, to suppurating disease of the middle ear. Cases of "running ears" which stop discharging, and which begin to develop head symptoms, should therefore be looked upon with suspicion. The symptoms of abscess are not very definite—indeed, even a large abscess may be present for a considerable time without any symptoms. Usually, however, there is headache and vomiting, which occurs without nausea, and without any relationship to the taking of food. The temperature is usually raised, but, on the other hand, may be continuously subnormal (96° F. to 98° F.), and the pulse-rate is usually slow; it may be only 40 to 50. There is often, also, some degree of blindness. Meningitis is not infrequently combined with abscess, in which case the symptoms of the former will mask those of the abscess. The treatment is purely surgical; the abscess must be opened and drained. No application of fomentations, &c., is of any use in the case of an abscess seated so deeply as in the brain.

Anæmia of the brain may result from a deficient supply of blood to the brain, or from poor quality of the blood supplied. It may be due to excessive loss of blood (see HÆMORRHAGE), it is present in anæmia of any sort (see ANÆMIA), and it may also occur in heart disease (see HEART, DISEASES OF THE). Fainting is the chief result of any great or sudden weakness of the heart's action, whereby the brain is almost completely deprived of its blood supply. In lesser degrees of anæmia there will be, in addition to the general symptoms of anæmia, giddiness, ringing in the ears, dimness of vision, sleeplessness, and sometimes muscular twitchings. The treatment will be that of anæmia or of heart disease, but in any case where there are definite symptoms of anæmia of the brain the patient should be completely confined to bed and be very cautious about sitting up until seen by a doctor. Special heart tonics may be required.

Apoplexy.—Apoplectic fits, shocks, strokes, or seizures vary considerably in their character, but, as a rule, this condition will be correctly diagnosed when, in an elderly person, there is more or less sudden complete loss of consciousness and power of movement, with slow, deep, noisy breathing, a slow, strong pulse, and pupils which do not contract when a strong light is brought in front of them, and the person cannot be roused at all.

Apoplexy is, in the great majority of cases, due to hæmorrhage into the brain by the bursting of a blood-vessel; a few cases, and those only in persons with valvular disease of the heart, are due to the plugging of a blood-vessel with a part broken off the diseased valve (see *Embolism*, infra); and a few, usually in debilitated persons, to clotting within the blood-vessel—*i.e.* to thrombosis (see *Softening of the Brain*, infra). The description here will have reference only to those cases due to hæmorrhage.

Apoplexy is a disease of later life; it is commonest in persons over fifty, although it does occasionally occur in younger people, even in children. Red-faced individuals of a stout, bull-necked build are supposed to be peculiarly liable to apoplexy, but it is doubtful if they really are more often attacked than others. Those who do suffer are those in whom there is degeneration of the arteries, so often the result of alcoholism, syphilis, or overstrain (see ARTERIES, DISEASES OF), or those with chronic Bright's disease. The actual attack may be brought about by any unaccustomed or severe strain suddenly raising the blood-pressure to bursting-point—*e.g.* running after a car, or even stooping to tie a bootlace. Excessive drinking or any excitement, and especially anger, may also cause cerebral hæmorrhage, while not a few cases occur when the individual is sleeping peacefully in bed. He wakes in the morning paralysed, or is found, it may be, unconscious. There are often warnings of an attack, which are referred to under diseases of the arteries, such as a sense of fulness in the head, ringing in the ears, giddiness, and slight mental confusion.

The attack is usually quite sudden, with rapid loss of consciousness, although sometimes it comes on more gradually. The face may be red or ashen-grey; the pupils are usually dilated, often unequal, and they do not contract when a strong light is brought near them; often, also, there is an upward squint. The respirations are deep, slow, and noisy, one cheek puffing out more than the other; the pulse is slow and strong. One side is paralysed usually, and this can be told even although the patient is deeply unconscious. On lifting the arm or leg on the affected side it drops like a stone, whereas on the healthy side there is not this absolute relaxation. This point is of great practical importance, as it absolutely differentiates apoplexy from the unconsciousness of opium poisoning or of profound alcoholic intoxication. In these two conditions the patient can also, as a rule, be roused to some extent, whereas in apoplexy he cannot. Assistance is given by noting the state of the pupils: in opium poisoning they are equal but of tiny, pin-point size; in alcoholic poisoning they are equal but large, and do contract with a bright light.

The unconsciousness may last for a few hours only, or it may last for several weeks and still be recovered from. The most favourable cases are those in which consciousness is either never lost at all or is very soon regained; the worst those in which it becomes deeper. These may end in death in a few hours. Within a few weeks the paralysis may be very largely recovered from, although some trace of it usually remains; the mental powers generally suffer also to some extent, and there may be aphasia. (See APHASIA and PARALYSIS.)

Treatment.—For preventive measures see the advice given under diseases of the arteries. For the actual attack, unfortunately, not very much can be done—in fact, the treatment has sometimes been described as "masterly inactivity." The patient should be put into bed at once so as to obviate moving at a later stage, care being taken to loosen any tight clothing about the neck or chest. The head should also be propped up well with pillows to diminish the blood-flow to it, and, with the same object in view, an ice-bag may be placed on it and hot bottles to the feet. As the patient may be confined to bed for a considerable time, it is often wise to procure a water-bed, and generally to pay great attention to the skin, so as to obviate the formation of bed-sores (see Nursing Section). Do not give stimulants to try and bring the patient round; they simply make the heart beat more forcibly, and so make the hæmorrhage worse. No excitement should be allowed; the fewer visitors, even of immediate relatives, the better. After about ten days, gentle massage and passive movements of the affected limbs will probably be ordered.

Compression of the brain results usually from some accident whereby a fragment of bone is driven down on to the brain, or a blood-vessel is torn inside the skull and a clot of blood forms on the surface of the brain. The symptoms vary somewhat, but the essential feature is unconsciousness coming on some time after the accident. (See *Concussion.*) When fully developed, the patient is in a condition very similar to that of a person who has had a severe apoplectic seizure.

The only effective treatment is trephining (opening into the skull) and raising the depressed bone, or clearing out the clot and tying the vessel so as to stop any further bleeding. Failing such measures, the only thing to be done is to keep the patient quiet, with the head cool, and the room darkened and noiseless. Sometimes there is trouble with the breathing through the tongue falling back. If this occurs, the head should be rolled over to one side or the tongue pulled forwards. If not operated upon a patient may remain in this condition for months.

Symptoms of compression may develop slowly from the presence of tumours or abscesses.

Concussion.—This is the stunned or dazed condition resulting from some injury to the head. It varies with the severity of the cause from a slight momentary giddiness and confusion of thought to the most complete insensibility. The condition of the brain varies from slight pin-point hæmorrhages to complete disintegration.

In a marked case there is unconsciousness, but the patient can often be partially roused by shouting at him. He lies limp, the skin is cold and clammy, the pulse weak and fluttering, and the temperature subnormal. The condition may last for a considerable time, and then pass slowly into more profound unconsciousness and death; or it may be followed by the symptoms of compression. If, however, the case is going on to recovery, signs of reaction soon show themselves. The first sign will probably be deeper and more audible breathing, then some spontaneous movement. Gradually the patient becomes more rational, and the functions of both mind and body are restored. It must be noted, however, that subsequent events may prove that more mischief has been done than appears at once. Some part of the memory may be lost; there is often great irritability of temper, inability to do any steady work, either mental or physical, or general loss of nerve tone. (See NEURASTHENIA.)

Treatment.—This is much the same as that of shock, a condition closely allied to concussion. Put the patient to bed with the head low, cover with warm blankets, and put hot-water bottles to the feet and along the sides of the body, taking care, however, not to have them too hot, as such a patient is very easily burnt. Stimulants are best avoided, as they may set up bleeding. On the establishment of reaction, but not before, a good purge, such as five grains of calomel in the form of a powder or pill, should be administered, and the patient is then kept in bed for some days on a light diet. It is a good rule to treat all cases of concussion, even the very slightest, as cases of possible compression. Therefore, whenever there has been even a momentary unconsciousness from an accident, keep that person in bed and quiet for a day. Compression will not come on after that time. In many instances this may seem over-caution, but every now and again it happens that persons who have had slight concussion go about whenever they recover, symptoms of compression come on in a few hours, and whoever allowed them to move about is held to blame, and perhaps rightly, as, had they been kept quiet, the bleeding might not have occurred.

Embolism of the Cerebral Arteries.—This produces one form of apoplexy. It occurs practically only in cases of heart disease, and means the breaking off of a little piece of clot and plugging of one of the arteries of the brain. The symptoms are exactly the same as in apoplexy due to hæmorrhage. It will be absolutely sudden, and there will be none of the warnings which may precede a hæmorrhage. The result is an area of softening of the brain, owing to its blood-supply being cut off. As the condition can only be definitely distinguished from other forms of apoplexy by careful examination of the heart, nothing special need be laid down about the treatment.

Brain-fever.—See MENINGITIS.

Hæmorrhage.—See *Apoplexy*, supra.

Hydrocephalus.—The condition of hydrocephalus, or *water on the brain*, occurs most frequently in children, and a glance at the head is usually sufficient to render the diagnosis clear. The head is greatly enlarged, and may measure even up to 50 inches round the forehead. The brow appears to overhang the small, pinched face, and the head may be so heavy that it cannot be raised from the pillow, or it may have to be supported between the hands. The cause of this condition is not always clear; it may be present before birth and interfere greatly with labour, or it may develop after birth, generally in children who are otherwise of delicate constitution, and it is not infrequently associated with other defects of development. It may also come on at a later period of life, as a result of the pressure of a tumour, or of meningitis, interfering with the flow of blood away from the brain, so that the ventricles, or cavities, become greatly distended with fluid. When it comes on in older subjects, in whom the bones are more or less completely ossified, the skull cannot yield to anything like the same extent, consequently the active signs of pressure internally (headache, vomiting, blindness, &c.) are much more in evidence. (See BRAIN, *Tumour*, also MENINGITIS.) The pressure of the fluid on the brain is certain to affect the mental condition of the patient. The child is usually dull and listless, and may even be quite imbecile; if the disease is getting worse it becomes blind and paralysed. Although they may live to a good old age with minor degrees of hydrocephalus, such children are usually delicate, and readily succumb to any little illness which a strong child would easily get over.

Treatment.—The child should be fed on good nourishing food and given tonics, such as cod-liver oil emulsion or Parrish's chemical food (a teaspoonful after meals, thrice daily), and a medical man should be consulted as to the advisability of having the fluid tapped and drawn off, as sometimes good results have followed on this having been done.

Softening of the Brain.—This term is often used popularly for the train of symptoms which result from atheroma, or disease of the arteries of the brain. (See ARTERIES, DISEASES OF.) Real softening of brain tissue may result from clotting of the blood within a vessel (thrombosis) bringing about a state of affairs exactly like those described under apoplexy, only differing in that they come on gradually instead of suddenly. This may happen in people with diseased arteries, or it may simply be the result of enfeebled circulation, as in old age, or after a weakening disease such as typhoid fever. The loss of consciousness is not often so complete, however, as in apoplexy from hæmorrhage. The outlook is not good, because repeated attacks are apt to occur. The treatment must be on different lines from that of hæmorrhage, stimulants being indicated to try and keep the circulation going. Small quantities of alcohol may be given, or half a teaspoonful of sal volatile in a wineglassful of water every three or four hours. The diet should be as strong (soups, beef-tea, &c.) and as plentiful as the patient can digest.

Tumours.—The symptoms of tumours of the brain vary considerably with the part of the brain affected, but there are four symptoms common to all—viz. headache, vomiting, giddiness, and more or less blindness. The headache may be dull and aching or sharp and shooting; the vomiting occurs without nausea, and may take place at any time after the intake of food; the giddiness or vertigo is often most marked when the person makes any sudden movement; dimness of vision may not be noticed by the patient for a considerable time after the other symptoms have appeared, but examination of the back of the eye by a doctor often reveals the optic neuritis to which it is due at a very early stage, and it is an important aid in diagnosis. Convulsive seizures sometimes occur, and as the tumour enlarges the patient tends to become dull, sleepy, slow of thought and speech, and the memory may fail. The pressure may obstruct the outflow of blood, so that hydrocephalus occurs, and, as the pressure increases, the patient becomes more and more comatose and insensible. Tumours occur at all ages. A few are syphilitic in their nature, and here the outlook is favourable when treated on the same lines as syphilis (see SYPHILIS); a few, especially in young people, are tubercular, and may improve somewhat when treated in the same manner as tuberculosis elsewhere (see TUBERCULOSIS); for the majority, operation, whenever the condition is definitely diagnosed, is the only rational treatment. In only about 5 to 10 per cent. is the tumour completely removable, but in a great many, symptoms, especially the often unbearable headache, can be alleviated, and the remainder of the patient's life made fairly comfortable. If this is not done, sedatives will have to be given for the pain. An ice-bag to the head sometimes relieves the headache considerably, and ice to suck often makes the vomiting less severe.

Water on the Brain, or *Water on the Head.* See *Hydrocephalus*, supra.

Break-bone Fever.—See DENGUE.

Breast, Diseases of the.—*Cracked nipples* occur in nursing mothers, and can usually be traced to a want of care and cleanliness, associated with a tender condition of the skin, which might have been prevented by bathing the nipples during the later weeks of pregnancy with spirit, so as to harden them. The actual cracking is brought about by leaving the nipples wet after nursing. The best way to prevent their occurrence is to bathe the nipples immediately after nursing, and then to dry them thoroughly. If at all tender, dust a little powdered boracic acid and starch over them in the intervals. If cracks have formed, then the nipples must be kept constantly covered with a piece of lint soaked in boracic lotion until they heal. Sometimes the cracks require to be touched with bluestone (a crystal of sulphate of copper moistened in water being lightly rubbed once along the crack).

Eczema of the Nipple.—When the nipple presents a raw, red, and continuously moist appearance, a little Lassar's paste should be obtained and smeared over it night and morning, while at the same time a vulcanite nipple shield is tied over it to prevent the clothes from rubbing and irritating.

Inflammation and Abscess of the Breast.—1. *Acute inflammation* may occur in young infants, but it is most commonly seen in mothers soon after the birth of a child, especially in young women after their first baby. It results in most cases from infection getting in through a cracked or sore nipple. The breast becomes swollen, acutely painful, and tender, and, as it is too painful to allow the child to suck, it gets very tense from the accumulation of milk. If actual suppuration and abscess formation follows, the skin over some part or other of the breast becomes red and puffy. Inflammation of the breast usually occurs in women who are anæmic and weakly, and there is always considerable fever and out-of-sorts feeling.

The treatment consists, in the first place, in supporting the breast by a sling or broad bandage passing alternately round the waist beneath the breast and up over the opposite shoulder from beneath the breast, and in binding the arm to the side, so as to keep the pectoral muscle, on which the breast lies, at rest. Simple hot fomentations or poultices are then applied, and any tension relieved by a breast-pump. If the condition is at all bad the child should be weaned entirely, and the secretion of milk stopped by the application of a belladonna plaster and the administration of a large teaspoonful of Epsom salts night and morning for a day or two. If there is any appearance of fluctuation (see ABSCESS), and the formation of an abscess, it should be opened at once. Never wait for it to burst, as by the time that occurs the abscess will probably have burrowed all through the breast, and will take a long time to heal. The following iron and quinine tonic is recommended:

℞ Tincture of perchloride of iron	5 drachms
Sulphate of quinine	40 grains
Glycerine	1 ounce
Water	to 4 ounces

Take a teaspoonful in water three times a day, after meals.

2. *Chronic inflammation* occurs in two forms: (*a*) Affecting only a portion of the breast. This may come on when nursing is over, or it may be the result of injury or of badly-fitting corsets. It is characterised by the enlargement of one part of the breast, and is often exceedingly painful, the pain being of a shooting, neuralgic character. It is not a dangerous condition, but is apt to give rise to a great deal of anxiety and worry, as it looks very like a tumour. All that is required in the way of treatment is to support the breast with a bandage, and to keep the arm in a sling, whilst a piece of belladonna plaster a little larger than the swelling is put on. If it does not quickly disappear with these measures, a doctor should be consulted. (*b*) A form occurring usually in women with small breasts, and who are about, or past, the change of life. The whole breast becomes somewhat enlarged, painful, and lumpy; cysts may form in it. The breast may remain in this condition for a long time, but as it is always a difficult condition to distinguish from cancer, and as it may undoubtedly become cancerous, it is wise not to delay in getting a surgeon's advice.

Tumours of the breast may be of a simple, non-malignant, or non-dangerous kind—many of them are—but, on the other hand, they may be distinctly malignant, or, in other words, cancerous. After the womb, the breast is probably the commonest seat of cancer in the body. Now no characters can be given whereby the one form of tumour can be distinguished from the other in the early stages; a harmless-looking, painless little lump may quite well be a cancer; even a surgeon cannot always tell until the tumour has been cut out. It has been stated above, also, that chronic inflammation produces appearances which are difficult to distinguish from cancer. There is only one safe rule, therefore, to follow, and that is: if a lump or swelling appears in the breast, at any age, do not go on worrying and fretting about what it may be, but see a surgeon *at once*. If cancer be present, or if there be some doubt about it, then the sooner an operation is done the better. It cannot be too strongly insisted upon that so far there is no drug cure for cancer, and that the only hope is complete removal by the knife; and the earlier this is done, before the cancer has had time to spread, the more chance there is of a complete cure. The operation itself is, in this instance, not a dangerous one, and, if performed early, there is every prospect of complete removal being possible.

Breath, Bad or Foul.—An unpleasant or foul odour of the breath is usually more noticeable to those around than to the person with it. We will merely mention here the conditions giving rise to it; the treatment will be found under the individual diseases, but it might just be remarked that the smell can be temporarily obscured by taking occasionally a drop of peppermint oil or chewing various strongly-scented sweets. Query: Is the disease or the cure the more bearable for those with whom the individual comes in contact?

Local conditions in the mouth, especially accumulations about the teeth in those to whom the cult of the tooth-brush is unknown, are apt to make the breath stale and musty. Decayed teeth and chronic tonsilitis are other common causes. Some diseases of the lung give rise to an intensely fœtid odour, the like of which can hardly be equalled, but they are rare. A very common cause is some form of gastric catarrh or dyspepsia, especially that caused by chronic alcoholism, and it is sometimes due to constipation. In children with gastric disorders it is often merely a sour smell. Diseases of the nose, particularly that form known as ozæna, may give rise to very disagreeable odours.

Breathlessness, or *shortness of breath*, can only be considered a disease, or rather a symptom of disease, when it is present at rest or on very slight exertion. It means that the body is not being supplied with sufficient oxygen for its needs, so that excessive involuntary efforts are made to take in more air, and it may be due to disease in the lungs or air-passages preventing a proper intake of air; in the blood, which is the carrier of the oxygen to the tissues; or in the heart, whereby the aerated blood is not kept circulating properly. Amongst conditions narrowing the air-passages and producing breathlessness may be mentioned adenoids, a common affection of children, causing them to go about constantly open-mouthed; croup, which is also seen chiefly in children, coming on suddenly and often causing alarming breathlessness; asthma; and diphtheria. Almost every disease of the lungs, by diminishing the area available for breathing, causes shortness of breath—*e.g.* pneumonia, consumption, bronchitis, &c. Pleurisy makes the breathing quick and short to avoid the pain of deep inspirations, and peritonitis has the same effect. Any large swelling in the abdomen or dropsical accumulation of fluid therein, by impeding the movement of the diaphragm, also makes breathing difficult. Practically all affections of the heart, including the fatty heart of corpulent persons, cause breathlessness; and, lastly, anæmia is a common cause, especially in young women.

The treatment naturally varies with the cause. Sometimes breathlessness is *the* symptom most urgently requiring relief, in other cases it is comparatively unimportant, and improves under the general treatment of the disease. Rest in bed is usually advisable, and propping up with pillows in bad cases. For further details the individual disease mentioned must be referred to.

Bright's Disease.—The term Bright's disease includes several very distinct varieties of inflammatory or degenerative disease of the kidneys. We must at least distinguish an acute form, and two varieties of chronic Bright's disease.

Acute Bright's Disease.—The outstanding features of this are sudden onset of feverishness, general discomfort, pain in the back over the kidneys, puffy dropsical swelling under the eyes, and diminution in the amount of urine, with the appearance of blood in it. The commonest cause is exposure to cold and wet, especially where perspiration is suddenly checked, or where alcoholic subjects or debilitated persons are exposed to sudden and great changes of temperature. It is also a common and serious complication of some fevers, especially scarlet fever, in which case it is likely to appear during convalescence, and the symptoms do not come on quite so suddenly. The disease is common in childhood and up to middle life, but is rare after that period. It is a disease of temperate rather than of warm climates. Pain in the back, vomiting, and shivering fits often usher in the attack, the temperature reaching 101° F. or 102° F. Puffiness of the face, especially under the eyes, appears in a few hours, whilst the eyes themselves have a glistening, watery appearance. The urine is scanty in amount, although a little may be passed often; it is red or smoky in colour, from the presence of blood, and chemically it is found to contain considerable quantities of albumen. The dropsy may extend over the whole body in severe cases. The outlook is often favourable, although a month or more may be required for recovery. The post-scarlatinal cases are not so favourable as those due to cold or wet, more especially in children, in whom there is a considerable mortality from the disease. Bad features are: great diminution in the amount of urine, leading to accumulation of waste products in the blood (uræmia, *q.v.*); headache, convulsions, and unconsciousness, often with a fatal termination; excessive dropsy, interfering with the action of the heart and lungs; or the condition may not clear up, but subside into one (the dropsical) form of chronic Bright's disease.

Treatment.—This requires great care, because, if complete cure of the acute attack is not obtained, the patient becomes an invalid for the remainder of his life, and even that is not likely to be very long. A doctor's advice should certainly be obtained, but the following outline of treatment may be given. The patient should be kept strictly in bed between blankets, and flannel garments only worn. This is desirable, because free sweating forms perhaps the most important method of treatment, and chills must be strictly avoided. The diet had better be limited to milk or buttermilk, and that alone, although sometimes gruel, arrowroot, and the like are permitted. As recovery occurs, spinach, cauliflower, and similar vegetables may be added to the dietary, but no eggs, fish, or meat should be given until the albumen has disappeared from the urine. This can only be told by chemical examination, but it will not be until after the dropsy has completely gone. Oranges and lemons can be permitted throughout, and large quantities of water should be drunk to wash out the kidneys. Distilled water or Salutaris is even better than ordinary tap-water. Purgative mineral waters such as Hunyadi Janos, or a dessertspoonful of Epsom salts or Carlsbad salts dissolved in half a tumblerful of water, may also be taken daily to produce watery motions and thus diminish the dropsy. Hot baths and hot packs (patient wrapped in a blanket wrung out of hot water and covered with a large mackintosh sheet for half an hour once or twice daily) are most important to encourage free sweating. If there is much pain over the kidneys, hot poultices should be applied over the small of the back. We shall not refer to the more severe measures necessary when uræmia is threatening. As the drain of albumen always produces anæmia, iron is usually required during convalescence, but not till then. After the acute stage is over the patient should, if at all possible, go to a warm, dry climate, and must in any case guard carefully against chills and partake very moderately of animal food and of stimulants.

Chronic Bright's Disease.—(*a*) *The Dropsical Form.*—This may result from an acute attack which has not cleared up, or it may come on gradually. The symptoms are dropsy of the face and body, and profound anæmia, the two together giving the patient a pale, puffy, and pasty appearance. Vomiting and diarrhœa are common, uræmic symptoms are frequent, and may cause death. The urine is at first small in amount, and contains much albumen and possibly a little blood; later it may be considerably increased in quantity. This type of Bright's disease is apt to occur in heavy drinkers; in any person suffering from chronic suppuration, such as in tubercular disease; or it may come on in place of the acute form after exposure, or after an attack of scarlet fever. The outlook is not good: the patient is a chronic invalid for the rest of his life, which is not likely to be very long.

The treatment must be on the same general lines as that of acute Bright's disease, but care must be exercised in using any strong measures. It is not advisable to drink such large quantities of liquid, however, and a diet which is salt-free will often be found to diminish the dropsy very greatly. This means that even the bread must be specially baked, and no salt added to or taken with the food. Such a dietary is very uninteresting, and patients can seldom be got to keep to it strictly for very long.

(*b*) *Non-dropsical Form.*—This is a very common disease, particularly in men over the age of forty. It is an insidious disease. A person with it may look the picture of health—the John Bull type of man, for instance—and the degeneration of the kidneys may be far advanced before it attracts the attention of either the patient or the doctor. Amongst the earliest features are tiredness and headache, sleeplessness, dyspepsia, and the passage of an increasing amount of urine, necessitating the patient's rising several times during the night. The disease is always associated with disease of the arteries, and all the features of that may be present. The heart becomes greatly enlarged, the blood pressure rises, and the patient may be said to be always standing on the verge of apoplexy. Uræmia is another mode of termination in these cases. Squeamishness and vomiting in the morning are common. Dropsy rarely occurs. This form of the disease is most likely to occur in persons who habitually "do themselves well," but who might be greatly insulted if they were told that they ate or drank too much. The idea that a lot of meat is required to keep up one's strength is undoubtedly responsible for the development of a lot of chronic kidney and arterial disease. Excessive indulgence in alcohol, syphilis, gout, muscular overstrain, and, to a large degree, mental overwork, may also be factors in the development of this form of chronic Bright's disease. The condition is incurable, but a long and useful life may be enjoyed by the patient, provided that the greatest care is taken to guard against any over-exertion, any indiscretion in diet, and imprudence as regards exposure to cold and damp. The patient must therefore live a very quiet life with little mental or physical effort. Alcohol is better forbidden altogether, and the diet should be a light and easily digested one. Meat need not be interdicted altogether, but should be taken only in small amounts, and never more than once a day. Meat extracts, beef-teas, and the like, which are so popular, throw, of all things, the greatest strain on the kidneys, and must be avoided like the plague. Warm clothing, for the hands and feet as well as for the body, is important. Warm baths should be taken regularly, three or four times a week, but be careful to avoid any chill after them. It is generally advisable to have the bowels moving rather loosely, and this is best provided for by the daily morning use of one of the mineral aperient waters, such as Apenta, or of Epsom or Carlsbad salts. Too vigorous purgation is, however, to be strictly avoided. There is no specific curative drug, but individual symptoms often require relief. We can only here lay down the main lines on which a person with chronic Bright's disease should proceed. Since cases vary so much, and as every individual's mode of life is different, it is advisable that a doctor should be consulted occasionally as to the regimen to be followed, and for any special features as they may arise.

Bronchiectasis.—See Lungs, Diseases of the.

Bronchitis.—Catarrh or inflammation of the bronchial tubes. This disease, which is exceedingly common in a climate such as that of Great Britain, occurs in an acute and in a chronic form. The acute form, when it affects only the larger bronchi, is familiar to every one as a common cold in the chest. This will be described as acute simple bronchitis. When the inflammation extends down to the smallest bronchial tubes it is known as capillary bronchitis, and is then a much more serious and even dangerous disease.

Acute simple bronchitis, or common cold in the chest, is in most cases a catarrhal inflammation due to germs, although it may also be caused by the inhalation of irritating vapours such as city fogs. Cold and damp are powerful predisposing agents, lowering the vitality of the bronchial mucous membrane and permitting the germs to gain entrance, although cold and damp are not in themselves sufficient to cause "colds," as the experience of polar explorers shows. General delicacy of constitution also renders people more liable to catch the infection of colds, and so does coddling and living in hot, stuffy rooms. Cold in the chest is not infrequently an extension from a cold in the head, and it is sometimes part of a more general disease, such as influenza, typhoid fever, measles, or whooping cough. The symptoms are as follows: at first a hard dry cough, with pain behind the breast-bone, a varying degree of general malaise and discomfort, and slight feverishness, the temperature being perhaps 101° F. or 102° F. The breathing is somewhat wheezy, being often rather more so at night. The cough soon becomes worse, and brings up a small amount of thick phlegm, after which there is usually temporary freedom from cough. Then the secretion becomes much more abundant, yellow and frothy, comes up with ease, and the cough is not so severe. Lastly, the cough and the bringing up of phlegm gradually cease, and the cold is at an end. Some loss of appetite and constipation are present, as they are in practically every feverish affection. The condition is not a serious one except in the very young or very old, in whom it is apt to extend to the smaller tubes. The treatment is comparatively easy if a person can give up his time to it, but, unfortunately, very few are so situated that this can be done. Ammoniated tincture of quinine is a very favourite remedy, but it is one in which we have very little faith. Another remedy often used for children is tincture of aconite. In the early stages this certainly slows the rapid pulse and diminishes fever, but it does not cure the cold and is rather a risky drug. What we would recommend is, at the very outset, a hot bath, a hot drink, a mustard leaf on the chest for a quarter of an hour, or a good rubbing with camphorated oil, and so to bed, as Mr. Pepys would say. A simple sweating drug will do no harm if taken with the hot drink—*e.g.* half a teaspoonful of sweet spirit of nitre. If possible, for a day or two the patient should stay in bed, or in a warm room, the air of which is kept moist by a kettle on the fire. This will often be sufficient to stop the attack. In severer cases more energetic measures will be required. Great relief will be got from the use of a tent round the bed, and a bronchitis kettle. This means the rigging up of a clothes horse, with blankets over it, round the bed, and a kettle with a long spout continually pouring steam into the tent. If this cannot be managed, then have an ordinary kettle on the fire, and an open, shallow basin of water standing in front of the fire; and for a few minutes every hour the patient should inhale the steam coming off a jug of boiling water, to which has been added half a teaspoonful of Friar's balsam. This is undoubtedly one of the most valuable of remedial measures, and gives great relief to the cough and expectoration. Cough mixtures may be had in legion; we would only like to give the warning that many of the "soothing" mixtures contain opium in such amount that fatal results may follow their use in young children and in old people: the sensitiveness of the bronchi is dulled to such an extent that secretion accumulates without any desire to cough, and the unfortunate person is practically drowned in what should have been brought up by coughing. A safe cough mixture, and one which can be used at all stages, is ipecacuanha wine, of which 10 to 15 drops may be given in water every two or three hours; and it helps to lessen the toughness of the phlegm, and makes it more easily brought up, if a pinch of baking-soda be added as well. In the later stages, when the expectoration is free, a little vinegar in water taken occasionally will lessen the secretion.

Acute capillary bronchitis, or bronchitis affecting the finest branches of the tubes, is common in children, and especially with measles and whooping-cough. In adults it may be due to the inhalation of irritating vapours, such as strong ammonia, or the inhalation of food particles, &c. In both instances it is often the precursor of broncho-pneumonia (see LUNGS, DISEASES OF THE), a form of inflammation of the actual lung tissue, and is practically indistinguishable from this disease. It is always a serious affection. In this form of bronchitis the temperature is always high, 104° F. or 105° F. often. There is great breathlessness, pain on coughing, and rapid exhaustion. Where the child is old enough and sufficiently conscious it will be sitting up to breathe, and the sides of the nose will be working vigorously. Signs of great severity and of danger are as follows: (1) where the shortness of breath is so great as to prevent crying and feeding, and where the feebleness is so great that coughing ceases; (2) where the temperature rises to 105° F. or over, or where it falls to normal or thereabouts without any improvement in the general symptoms; (3) where the colour becomes very dusky.

Treatment.—It is important to guard very carefully against chills in children during convalescence from fevers. Should bronchitis ensue, the patient should be put in a tent as described above, into which a bronchitis kettle is constantly discharging steam. To prevent the bronchial tubes from choking up with secretion, it is very advisable to alter the position of the little patient from time to time, keeping the head high, and occasionally lifting him out of bed altogether. If the cough is not effective, a very good plan is to give an emetic dose (a teaspoonful) of ipecacuanha wine, the strain of vomiting clearing the bronchial tubes. Keep a careful watch on the temperature, and, whenever it rises as high as 103° F., sponge all over with cold or tepid water. This is a most important measure, and many lives are lost through not attending to it. You need not be afraid of the child being chilled by the exposure; the raised temperature is ample provision against that. Also, do not have too many clothes heaped on the child; a common mistake is to heap on things "to prevent the child catching more cold": the result is that breathing, already embarrassed, is rendered still more difficult. One good warm jacket is all that is required. The chest should be rubbed with a stimulating liniment, such as camphorated oil or turpentine liniment. The diet must be of the simplest, the child being fed every two hours with a little milk or egg-flip, and it is safe and wise in most cases to add a few drops of whisky or brandy to each feed. The special medicinal measures must be left to the doctor, who will always be required in such a case.

Chronic Bronchitis.—Typical attacks of this are seen in elderly persons during cold weather, and are frequently called "winter cough." The attacks tend to become worse each succeeding winter, although the cough may be quite away in summer. It may follow on a series of acute attacks, and it is more likely to occur in persons working at dusty trades, in rheumatic subjects, and in persons with chronic Bright's or heart disease. In addition to the cough, the sufferers may often be recognised by their rounded, barrel-shaped chests, with very rounded shoulders. Shortness of breath becomes marked, due not merely to the cough, but also to the embarrassed action of the heart. There is often also an element of spasm in the bronchial tubes, causing wheezy breathing just like that in pure asthma. The worst coughing and wheezing are either during the night, or else upon wakening, when the tubes are full of secretion.

Treatment.—Very little can be done, unfortunately, to prevent the attacks, if the patient is compelled to live in this climate. Sufferers are practically certain to have the cough more or less all winter, unless they can go to some warm, equable, dry climate, or unless they can live practically in one well-warmed (but ventilated) room throughout the winter months. Some, or even considerable, good may follow on vigorous counter-irritation of the chest—*e.g.* rubbing frequently with the turpentine liniment containing acetic acid, or with equal parts of turpentine and olive oil. The usual fit of morning coughing may be rendered more easy by drinking a cup of warm milk or of weak tea immediately upon wakening. Otherwise the treatment of chronic bronchitis is exactly on the same lines as that of the simple acute form.

Bubo and Bubonic Plague.—See PLAGUE.

Bugs.—See PARASITES.

Bunions.—Bunions are deformities due to that fashion which dictates that the toe of a boot must be in the middle, instead of where Nature meant it to be, in line with the inner side of the foot. In consequence of wearing such boots the big toe gets forced outwards over the others, great thickening of the bone develops at the base of the great toe, and usually also a hard corn over the enlargement. This condition is sometimes followed by that of "hammer-toe," in which the second toe becomes bent at its two joints in such a way as to resemble a hammer, while corns likewise form over the bends.

Treatment.—The condition will never develop if boots are worn sufficiently long, with the inner side straight and the toes squared; the width of the sole at the level of the little toe should be as great as that of the bare foot when the weight of the body is thrown on it. Mild cases may be rectified by wearing socks with a compartment for the great toe, and a partition of stout leather inside the boot to keep the great toe in proper line. Where there is inflammation and a good deal of pain in the bunion, rest and hot fomentations are indicated. A bar of leather running crossways over the sole of the boot, like that often put on football boots, but behind the level of the bunion, proves a great comfort, and allows walking without pain. Severe cases require operation—removal of a wedge of bone—for cure. If hammer-toe is present, the bunion is usually rectified first, and the hammer-toe then put right by forcible straightening.

Bursitis.—Bursæ are little sacks under the skin, situated over places where there is much friction or pressure; their function is to allow of free movement without stretching or straining the tissues. Bursitis means inflammation of this cavity, and the commonest example of it is when the sack over the knee-cap is affected, when we have the condition commonly known as "housemaid's knee." Another fairly common situation is over the tip of the elbow. The inflammation may be acute, and this is exactly like an abscess, and must be treated as such. Chronic inflammation, due to too much pressure—*e.g.* kneeling—is much commoner, and leads to a large accumulation of fluid, or to thickening of the walls of the bursa, producing in either case an elastic swelling over the joint, with a good deal of pain. Rest, with painting of iodine over the swelling, will usually cure the condition. The iodine should be painted on every night and morning for a day or two, then give a day's interval in which the skin is well anointed with vaseline. This will prevent cracking. Then proceed with the iodine again, and so on for a few weeks. Some bad cases of thickening without much fluid require to be operated on and the thickened sack dissected out.

Caisson Disease.—This trouble only affects divers and men working under compressed air in tunnelling operations and the like. The main symptoms are apt to come on when they emerge from the caisson, where they have been working under two or three times the ordinary atmospheric pressure; they are pains in the limbs and trunk, known as "bends," and paralysis of the lower limbs and bladder. The symptoms are due to frothing of the blood owing to the rapid fall of pressure, and escape of the air which dissolved in it under the increased pressure, and they may be entirely prevented by spending plenty of time in the decompression chambers which are now always provided in connection with such work—five minutes to each atmosphere being a good average.

Calculus.—Another name for *stone*. (For the features of *stone in the bladder* see BLADDER, DISEASES OF THE, also GRAVEL.) Calculi may form in the kidney, and, when the stone attempts to travel down the ureter to the bladder, the patient is seized suddenly with intense pain on one side over the kidney, the pain shooting down towards the bladder and inner side of the leg. This is known as *renal colic* (see KIDNEY, DISEASES OF THE). Calculi may also form in the gall-bladder as *gall-stones*, and, when these stones attempt to travel down the duct from the gall-bladder to the intestine, the patient is said to have an attack of *biliary colic*—excruciating pain over the liver, the pain extending backwards towards the right shoulder, and followed by jaundice. (See GALL-STONES.)

Camp Fever.—This term is used rather vaguely, but, as a rule, camp fever is either typhoid or typhus fever.

Cancer.—The term cancer is used to denote all those forms of tumour or new growths which are malignant and highly dangerous to the life of the individual in whom they occur. They are formed of the normal cells of the body, but of cells which, for some reason or other, grow and multiply excessively, and serve no useful function. The growth is to all intents and purposes a parasite on the body, and ultimately, if left unchecked, kills its host. Cancer is called a malignant tumour, as opposed to other simple or benign tumours, because in its growth it tends to invade and destroy the structures surrounding its point of origin, and also because the cancer cells get into the lymphatics and blood-vessels and are carried to other parts of the body, and there settle down and start off secondary growths, which are similar in structure and characters to the original. Thus, even when the original tumour has been entirely removed, if the operation has been too late, other growths may occur. The two chief forms of cancer are carcinoma and sarcoma. *Carcinoma* grows from the skin or covering tissues of the body, such as the mucous membranes lining the various canals and cavities of the body. It is a form of growth which is commonest in people of middle life or over it, but may occur even as early as twenty. *Sarcoma* starts from such tissues as bone or lymphatic glands. It occurs usually in young people, but is not so common as carcinoma.

The cause of cancer, despite all the work that has been done on the subject, is still unknown. Many theories have been advanced, but so far none has been found which will explain all the facts. Cancer occurs in all races of mankind, and in animals at least as low down in the scale as fish. It has been found possible to transmit certain forms of cancer in animals from one to another experimentally, but this cannot be taken to prove that cancer is due to some particular form of parasite, although the growth has been compared to a parasite. Certain factors seem to be important at times in determining the starting-off point of a growth, although they cannot altogether be regarded as the cause of cancer—*e.g.* local irritation such as that due to a sharp tooth or a clay pipe being followed by cancer of the tongue, or cancer of the skin following on the irritation caused by paraffin amongst persons working constantly with it. The influence of heredity does not appear to be very great. It is quite true that in some families the members of it do seem to develop cancer in one form or another as they get up in years, but, on the other hand, many cases occur in persons whose family history shows no such taint; and children whose parents, or one of whose parents, have died from cancer, are by no means certain to get cancer too. At the most it can only be said that they are a little more liable than others to develop it. Health and habits have nothing to do with it; people who have been hitherto quite healthy are just as likely to get cancer as weakly persons.

The symptoms naturally vary with the part of the body affected, and for details the individual organs must be referred to. It must be insisted upon, however, that at first there is seldom anything very distinctive. Thus, in the stomach there will only be some dyspepsia; in the breast, the presence of a small swelling; in the tongue or on the skin of the face, a little ulcer; in the womb, a little discharge, &c. The appearance also at first is not distinctive; there is nothing repulsive until the growth attains some size, and begins to break down and ulcerate. Neither is there much pain at first, although there may be in the later stages, when, also, the patient is likely to become very weak and anæmic. Great emaciation is likely to occur, and all the more rapidly if the stomach be the primary seat of the disease, and if there be secondary growths in the liver, as so frequently occurs.

Treatment.—It cannot be too strongly insisted upon that the only cure for cancer is its complete removal by operation. To this statement only a partial exception can be made in the case of very superficial growths such as rodent ulcer, a form of cancer affecting the skin, and which can be cured by X-rays, radium, &c. It will be obvious, from the remarks made regarding the growth of cancer, that the earlier the removal is done, before the growth has extended far from the starting-point, and especially before secondary growths have occurred, the better is the prospect of complete removal and cure. If the operation is done sufficiently early, the prospects, with modern surgery, are often good. The unfortunate thing is that, either from fear, ignorance, or lack of symptoms pointing to anything serious, so many cases are seen by the surgeon only when it is too late to get the growth completely removed. We would therefore urge the necessity of anyone, and especially anyone of forty or over, who notices a hard swelling, or who begins, for no very obvious reason, to suffer from symptoms which might be due to cancer of some internal organ, to consult a medical man at once. Do not waste valuable time in trying any of the reputed cancer cures in the hope that an operation may be avoided; in the present state of our knowledge the person who advises their use is little better than a murderer; their employment can only be justified in cases which are beyond operative measures, in the hope that they may do some good. If the swelling should turn out not to be cancer, then, at all events, much mental worry and anxiety will be avoided. The same remarks apply to sarcoma in young people. For inoperable cases of both carcinoma and sarcoma there are various measures which may be employed for the relief of symptoms, but these do not require to be detailed.

Carbuncle.—A carbuncle is sometimes regarded as a number of boils run together, but it really begins deeper in the skin than a boil does. There is at first a hard, painful swelling beneath the skin, which is dusky red in colour. The swelling widens until it may be several inches across, while the centre, at first brawny, becomes soft and boggy. Blisters form on the surface, these burst, and the openings thus formed run together, producing a large, central, ragged, crater-like opening, at the bottom of which lies dead tissue. As the violence of the inflammation subsides, all this dead tissue separates and comes away, leaving a clean but wide hollow, which takes a considerable time to heal up. Carbuncles thus differ from boils in being usually single instead of multiple, and flat and wide instead of raised and conical. They usually occur on the back of the body, where the vitality of the tissues is not very great. When they form on more vascular parts, such as the face, the consequences may be very serious from the readiness with which blood-poisoning occurs. Carbuncles seldom occur except in persons who are feeble, run down, or debilitated by some illness. With a carbuncle there is generally a feeling of seediness, but the temperature is not necessarily much raised.

The services of a medical man should always be obtained for a person with a carbuncle, not merely for the local condition, but because it generally means that the patient is in a very depressed state of general health. A search for diabetes should always be made, because both boils and carbuncles are peculiarly liable to occur in the course of that disease. Locally the carbuncle usually requires incision and scraping under an anæsthetic, and swabbing with pure carbolic acid. The general treatment of the patient has to be of a stimulating nature—strong soups, wine, and tonics such as Easton's syrup (one-half to one teaspoonful thrice daily after meals). A change of air to a bracing seaside place is often advisable after healing.

Carcinoma.—See CANCER.

Cardiac Disorders.—See HEART.

Caries.—This is a form of chronic inflammation, leading to softening and breaking down in bones and teeth. In bone it is usually a tubercular process; in teeth it is due to organisms in the mouth, and leads to the ordinary formation of cavities in the teeth. (See BONE, DISEASES OF; TUBERCULOSIS; and TEETH, DISEASES OF THE.)

Catalepsy.—A person in a cataleptic condition has, as a rule, as passive and expressionless a countenance as a statue; there is impairment or apparent loss of consciousness, of will-power, and of sensation; and, most characteristic of all, the patient lies, sits, or stands with the muscles in a state of rigid immobility, and if the head or limbs be placed by a bystander in an awkward, or what is usually an uncomfortable, position, they may remain so for an indefinite period of hours or even days, without any apparent voluntary effort or evidence of fatigue on the part of the patient. These attacks, or trances, occur at intervals, and usually come on quite suddenly. They may last only a few minutes, or they may last so long and be so profound that the condition might conceivably be mistaken for death. The condition is, however, a very rare one. In most cases it occurs in hysterical individuals, and is regarded as a manifestation of, or a condition closely allied to, hysteria. In other instances it seems to be due to some gross brain disease, and it may be associated with symptoms of epilepsy or insanity. For the trance itself it is probably best just to wait quietly for the patient to come out of it. The general treatment must be on the lines laid down for that of hysteria.

Cataract.—A cataract is any opacity of the lens of the eye which more or less completely obscures vision. The symptoms are: (1) Diminished acuteness of vision, which gradually increases until finally there is merely distinction of light from darkness. (2) The patient complains of seeing spots in front of the eyes; these spots are fixed in position, not floating. (3) Sometimes objects are seen double. (4) Shortsightedness often develops during the early stages, for which reason the patient may be able to discard reading-glasses for the time; this condition is popularly known as "second sight." When the cataract is well developed it becomes apparent to anyone, since, on looking into the pupil of the eye, instead of appearing quite transparent it looks as if it were filled up with ground glass. The commonest form of cataract is that coming on in persons over fifty; its cause is unknown. Cataract may be present at birth, due to faulty development; it is then usually associated with other defects in the eyes, and the results of operation are not very promising. Cataract may also be due to some general disease such as diabetes, to injuries, or to other forms of disease in the eye. It is always important, therefore, to have the eye examined while the lens is still at least partly transparent, because, if other disease be present, disappointment will only follow upon operation, the sight not being recoverable. Both eyes are almost always affected, but one is generally in advance of the other. The time required for full development varies greatly; some cataracts ripen in a few months, others require years. They may become stationary at any stage of their progress. The only treatment is operative removal of the opaque lens. No medicine or application of any sort has the slightest influence on a cataract. The time for operation, when the cataract is "ripe"—*i.e.* hard enough to be removed—can, of course, only be decided by the oculist. The operation is a very safe one even in old people, although requiring great skill. After removal of the lens, spectacles will be required to make up for the loss of the lens.

Catarrh.—Catarrh simply means inflammation of a mucous membrane, associated with a copious flow of mucous secretion. The term is used chiefly in connection with catarrh of the nose (see COLD IN THE HEAD), of the larynx (see THROAT, DISEASES OF THE, and CROUP), of the bronchial tubes (see BRONCHITIS), of the stomach (see DYSPEPSIA), of the intestines (see DIARRHŒA), of the conjunctiva (see EYE, DISEASES OF THE—*Conjunctivitis*), but it may be used in reference to inflammation of practically any mucous membrane.

Cellulitis.—This condition, a spreading inflammation of the loose cellular tissue beneath the skin, is almost identical in its characters with erysipelas. It only differs in not being infectious like erysipelas. Since the symptoms and treatment are otherwise identical, the reader is referred to the heading ERYSIPELAS.

Cerebellum and Cerebrum, Diseases of the.—See BRAIN, DISEASES OF THE, and NERVOUS DISEASES.

Cerebro-spinal Meningitis.—See MENINGITIS.

Chafing of the Skin.—This is apt to occur in babies where any two moist folds of skin come together—*e.g.* between the legs, or in the fold of the groin; also in stout, elderly persons in similar situations—in women, for example, below the breasts, when they hang down much. The prevention and treatment is the same in both instances—namely, careful washing, thorough drying, and then dusting over with a powder such as fuller's-earth, or, better, a mixture of finely-powdered boracic acid, starch, and oxide of zinc in equal parts. Pendulous breasts or pendulous folds of the abdomen sometimes require support by a bandage, and separation of the surfaces which rub together by dry wool.

Chafing of the feet is liable to occur in those who, being unaccustomed to much walking, are called upon to make a long march. This foot-soreness is a great trial to young or inexperienced soldiers. The measures which should be taken to prevent chafing of tender feet are as follows: First see that the boots are well-fitting. They should be stout and heavy, but should be well softened beforehand by being plentifully rubbed with dubbin or soaked in castor oil. The feet should be hardened beforehand by rubbing with methylated spirit night and morning after washing, or by bathing in a solution of alum (a teaspoonful to a pint of water) or of formalin (1 part to 20 parts of water). The socks should be thick, and dusted inside with boracic acid powder or with a powdered soap, such as "Watson's matchless cleanser." After the march is over wash the feet, dry, rub with spirit, prick any blisters, dust with dusting powder, and, if possible, change the socks.

Chalkstones.—See GOUT.

Chancre.—See VENEREAL DISEASES.

Chapped Hands.—See CHILBLAINS.

Chest Deformities.—Some deformities of the chest are indicative of a tendency to future disease in the chest, particularly of the lungs; others indicate actual present disease; while still others point to old, past, and, it may be, quite healed disease. Amongst the first group are those forms of chest known as *long chest*, *winged chest*, and *flat chest*. These forms may occur separately, but they are very often combined in the one individual. In a long chest the ribs slope downwards more than they should, so that they may almost touch the haunch bones, the neck is long, and the shoulders very sloping. In the winged chest the shoulder-blades stand out behind very prominently like wings; and in the flat chest, the front of the chest, instead of being rounded and projecting forwards, is almost or quite flat. In persons with these deformities of the chest there is always a weakness of the chest, probably because the lungs are never properly expanded, and such persons are very liable to contract consumption and other lung diseases. Very possibly they may come of a tubercular stock, a likelihood which will be increased if they are found to present a fine, delicate skin, fine hair, long upcurved eyelashes, big eyes, and an expression which may be described as "spirituelle." It is not meant to be inferred that such persons will of a certainty develop consumption or other form of tubercular disease, but only that they are much more likely to than others with well-developed chests. The chances, indeed, are so much in favour of their doing so that such a person would be well advised to follow some occupation which will enable him or her to spend most of the day in the open air, to be very particular about sleeping with open windows, and, if possible, to live in some country whose climate is a more suitable one for consumptive persons than this. Much may also be done to improve the condition of the chest by regulated exercises for the development of the size of the chest, and by the frequent practising of deep-breathing exercises.

Evidences of past disease may be found in the *rickety chest* and in the *pigeon breast.* The rickety chest, due to rickets in early life, shows a hollowing down each side from the yielding of the softened ribs. The lower part is often bulged out from moulding over the liver, and there may be a row of beads down each side at the junction of the ribs with the costal cartilages. In pigeon breast the breast-bone sticks out forwards like the keel of a pigeon's breast-bone. It also may be due to rickets, or may be the result of obstruction to breathing, such as is caused by enlarged tonsils and adenoids. The importance of these deformities is that they also render the lungs more liable to diseases; but here again a good deal can be done to improve the condition of the chest by suitable exercises designed to increase its capacity, and by deep nose-breathing.

Present disease may give rise to the *barrel-shaped chest,* in which the chest is more rounded than normal, the shoulders very rounded and bent, the chest being, in fact, kept blown out in a condition of almost full inspiration, so that breathing is made very laborious. This form of chest is due to the lung condition called emphysema, and may be seen in most cases of chronic bronchitis or in persons who blow wind-instruments. Very little can be done to improve this condition. Hollowing of the chest may be seen in several lung diseases, but particularly in severe consumption, when cavities have formed and the chest wall sinks in over them. This may often be noticed just under the collar-bones. Extreme deformity of the chest may, of course, accompany humpback, which is due to tubercular disease of the spine in the great majority of cases.

Bulging of the chest wall in one place may be due to a collection of fluid on one side (pleurisy), especially in children, in whom the wall is more yielding; or, if above the heart, it may be due to an aneurism of the aorta.

Chest Diseases.—Under this heading we will mention the chief symptoms and signs of disease in the chest, and the diseases they may point to. For further details and for treatment the individual disease must be looked up.

The shape of the chest may give some indication, as referred to under chest deformities. The movements of the chest on respiration are important to note. The respirations will be much more rapid than normal (this being about 18 to the minute) when any great extent of lung is thrown out of gear—*e.g.* in consumption, or, most of all, in pneumonia, where they may be up to 60 a minute or more. Where breathing is painful, as in pleurisy and pneumonia, the respirations are rapid and also very shallow, so as to diminish movement and thus lessen pain. One (the healthy) side may be obviously moving much more than the other where only one lung is affected, as is usually the case with pneumonia and pleurisy. Excessive pulsation or beating in the region of the heart indicates some form of heart trouble. Normally there should be seen only beating in an area which could be covered with a halfpenny below the fifth rib on the left side, just on the inner side of the nipple. Pain is an important symptom. It may be due to muscular rheumatism of the chest wall; the muscles will then be found tender to pressure. It may be neuralgia, in which case the tenderness will be found to be limited to certain sharply-defined points; if stabbing pain is felt at the end of each breath, it is probably due to pleurisy. Pain about the heart may be due to flatulent distension of the stomach pressing upwards, but, if severe and radiating down the left arm, and especially if brought on by exertion, it indicates serious heart disease or aneurism of the aorta. Breathlessness may occur with almost any heart or lung trouble. (See BREATHLESSNESS.) Cough is present in most affections of the larynx, the bronchial tubes, and the lungs; it may even be due to irritation from the stomach. (See COUGH.) Excessive bringing up of phlegm or of blood, &c., occurs in both heart and lung disease. (For the characters and significance of the different kinds of sputum see EXPECTORATION.)

Chicken-pox.—An infectious disease most common in early life, consisting in the appearance of successive crops of vesicles, or little raised blisters, about the size of a pea. The disease is quite distinct from smallpox; the one affords no protection against the other, nor does vaccination protect against chicken-pox. It generally occurs in epidemics; it is very contagious, the infection spreading by close personal contact or by clothes. There is an incubation period of from ten to fifteen days between the exposure to infection and the first appearance of symptoms. For about one day the child is feverish and out of sorts, then the rash appears. The rash begins as small, red, raised pimples on the forehead, face, and trunk, which in a few hours become vesicles filled with clear fluid. In one or two days the fluid becomes turbid, and soon dries up into a scab, which later drops off, leaving no scar. Several crops of vesicles appear for three or four successive days after the first ones, each lot running through the same stages as the original. Altogether there may be a few hundred pox spread more or less over the whole body, or there may only be a dozen or so. There is slight feverishness until the vesicles have all dried up into scabs. Recovery is usually quite perfect; only very rarely do severe cases occur which may be like mild smallpox, and difficult to distinguish from that disease. Adults also are affected occasionally.

Treatment.—The child must be isolated until all the scabs have separated—two to three weeks, probably—but need only be kept in bed until all the vesicles have dried up into scabs. The only treatment necessary is to relieve the itching, which is apt to lead to scratching, and this may injure the true skin and cause permanent disfigurement. This is best done by bathing the skin with a lotion of 1 part of carbolic acid in 60 parts of water, and by muffling up the patient's hands. If there be much eruption on the scalp, the hair had better be cut short.

Chilblains.—Chilblains are due to cold congesting those parts in which the circulation is least vigorous—the hands, feet, and sometimes the ears and nose. They are found in people with poor circulation, and who habitually suffer from cold hands and feet. The symptoms are only too familiar—viz. the appearance in cold weather on the hands or feet of thick, irregularly round, itching, burning, purple-coloured patches. These may go on, if care is not taken, to blisters, which, when they break, leave an ulcerated surface very difficult to heal.

Treatment.—In theory this is easy—improve the circulation or live in a warm climate—but practically it is a difficult matter to get rid of chilblains. Persons who are in poor general health will not get rid of them unless that is improved by good feeding, warm clothing, and tonics like cod-liver oil. Another necessity for cure is that the hands and feet be kept warm. Thick woollen socks and gloves should therefore be worn, and there must be no constriction of the circulation by tight boots or garters, or tight kid gloves. Vigorous outdoor exercise is advisable to promote the tone of the circulation. If the hands or feet do become cold, they should be warmed gradually by rubbing, not quickly by being held in front of the fire. Washing should be done only in hot water, and drying afterwards must be thorough. Locally the applications which have been recommended are legion, but all have for their object the stimulation of the circulation. One of the best is iodine, and the most convenient form is the preparation known as Iodex, an ointment which does not stain like the ordinary iodine preparations. It may be rubbed on twice daily. If ulcers form, they may be dressed with boracic ointment spread on a piece of linen, or they may be painted over with Friar's balsam. Good results sometimes follow the internal administration of calcium chloride.

℞ Calcium chloride	160 grains
Liquid extract of liquorice . . .	8 ounces

Dissolve. Take a tablespoonful thrice daily after meals.

Electrical treatment of various kinds has also been used with good results in some cases of chilblains.

Chapping of the skin is apt to occur under much the same conditions as chilblains, but is due more to the action of cold air on skin which is not quite dry, and is most apt to occur in persons who have their hands a great deal in water. Careful drying is important, and the hands may with advantage be rubbed every night, whether chapped or not, with a little glycerine and rose-water.

Chills.—A chill is rather a vague term, which often means simply that the person has got a bad cold, or it may be applied to the rather indefinite feverishness and out-of-sorts feeling which a person may get who has been chilled by exposure to cold or damp. Such attacks are probably not infrequently mild doses of influenza. Cold and damp are not in themselves causes of colds and chills; they act by reducing the vitality of the body, especially of the respiratory organs, thus permitting of the entrance of germs, which are the direct cause of the catarrh or inflammatory affection which follows. Most persons have some weak spot, which will be the one to suffer from exposure or chilling. Thus, one will get a cold in the head; another cold in the throat (laryngitis); another cold in the chest (bronchitis); while others may get pneumonia, pleurisy, or influenza. Some persons have a liability, as the result of a chill, to catarrh, not of the respiratory but of the alimentary tract, as is shown by the resulting dyspepsia and diarrhœa; in others it may set up acute Bright's disease or acute inflammation of the bladder. General diseases such as rheumatism may also result from chills. A person who has got a chill should have a hot bath, hot drinks, and a sweating powder—such as 10 grains of salicylate of soda or 8 grains of phenacetin with 2 grains of caffeine—and get to a warm bed as soon as possible. By these means any further trouble may be warded off.

Chlorosis.—See Anæmia.

Cholera.—Under this term will be described only the true Asiatic cholera. The form known as British cholera, also called infantile diarrhœa, summer diarrhœa, or epidemic gastro-enteritis, will be found under Diarrhœa.

Cholera is one of the four great epidemic diseases of the world, the others being plague, dysentery, and smallpox. It is an infectious fever characterised by vomiting, excessive purging, muscular cramps, suppression of urine, and very rapid prostration.

The immediate cause of the disease is the germ known as the cholera spirillum, or comma bacillus of Koch. This organism is found in myriads in the stools of affected persons, and usually gains entrance into the body in polluted water, which is practically the only medium whereby the disease is spread. The disease has been endemic in India for centuries, and from there epidemics have spread at various times to all parts of the world, being spread by infected pilgrims, or by cases on board ship. Conditions which may render one person more liable to an attack of cholera than another are: living in dirty, overcrowded surroundings, chills, intemperance, and fear. The last two factors certainly also lead to a greater fatality amongst those actually affected.

An attack of cholera begins with diarrhœa, violent in character, there being at first the frequent passage, with great force, of large quantities of semi-solid material; later on the diarrhœa becomes rather the almost constant passage of whey-like material, commonly called "rice-water stools." There is a sinking feeling in the pit of the stomach, and intense cramps, beginning in the legs, and later spreading all over the body. Vomiting and headache come on usually a little later than the diarrhœa. In about two or three hours the patient reaches the second stage, that of collapse. In this the diarrhœa continues as bad as ever, and there is vomiting of the rice-water-like material. The pain may be intense, or the patient may be so sunken as to cease to complain of the cramps. The thirst is intense, and the patient becomes rapidly exhausted and collapsed, the skin being shrivelled and of a ghastly bluish colour, and the eyes sunken. The surface of the body feels cold, but the internal temperature is high. The secretion of urine is suppressed. This stage lasts from two to twenty-four hours. The mental faculties are generally clear, although there is, as a rule, more or less well-marked apathy. Death often occurs in this stage. The third stage, in favourable cases, is that of reaction or recovery. In this the skin becomes warm, the pulse stronger, the diarrhœa and vomiting cease, and the kidneys begin to secrete urine once more. The patient still, however, runs considerable risk of relapses or of complications ensuing, which may be fatal even so late as several weeks afterwards. Cases, of course, vary considerably in their severity, and with each epidemic. What has been described may be taken as a fairly severe attack. Some cases are so severe that death may occur within an hour from the outset, while in mild cases there may be nothing more than pretty bad diarrhœa.

Treatment.—(1) *Preventive.* Persons living in an infected district should drink no water or milk unless it has been first boiled. All vegetables and fruits should be either cooked, or, if eaten raw, washed first with boiled water. Any alcoholic excess must be discouraged, and the general sanitary surroundings should be made as perfect as possible. Persons may be immunised by inoculation against cholera, the protection lasting about a year, and, while this may hardly be necessary for the general population, it should certainly be done for any one whose duties brings him or her into actual contact with cholera patients. Affected persons should be removed to cholera hospitals, and the most thorough disinfection of clothes, drains, and cisterns insisted on, so as to stamp out the source of infection. Remembering that the stools of the patient are highly infective, they should be destroyed by burning, or by disinfection with strong carbolic acid or with equal quantities of a 1 in 1000 solution of corrosive sublimate in water. All soiled linen, &c., should be either boiled or burnt. All cases of diarrhœa, however mild, should be looked upon with suspicion, and the excreta treated as if it were choleraic, otherwise mild cases might pass unobserved and the infection be spread far and wide.

(2) *Treatment of Symptoms.*—In the first stage efforts should be made to diminish the diarrhœa and relieve the pain by giving chlorodyne, 30 drops every two hours, or 20 to 30 drops of laudanum along with a pinch of cayenne pepper. There is no use attempting to feed the patient during the stage of vomiting and diarrhœa, but iced water may be given freely to drink, and a mustard leaf applied on the pit of the stomach, and another at the left side of the neck, may alleviate the vomiting. In the collapsed stage heat is essential, and may be supplied by the use of warmed blankets, and hot-water bottles to the feet, thighs, and armpits. To make up for the great loss of fluid from the body, cases are now often treated with subcutaneous injections of what is called a hypertonic solution of salt, and with very good results; but, of course, only a medical man with the necessary apparatus can do this. When the reaction sets in, the patient should be fed cautiously with small quantities of iced champagne, milk or wine whey, weak tea with a little brandy in it, or rice tea (browned rice infused with boiling water) and lemon. Starchy foods must be avoided at first, but some beef juice or scraped meat may soon be given. If the temperature should tend to rise again during convalescence, use cold sponging.

Chordee. — See Venereal Diseases — *Gonorrhœa.*

Chorea.—This disease, St. Vitus's dance, is met with principally in children. It is characterised by irregular, jerky, gestural movements of one or more limbs, and often of the face, which cannot be controlled by the patient. Chorea is now generally regarded as a rheumatic affection of the brain. Certainly it is common in children of rheumatic families, and in children who may show other evidences of rheumatism, such as pains in the joints and muscles, or valvular disease of the heart. Children who become affected with chorea are always nervous and high-strung, but it may be that this nervousness is really the first effect on the brain of the rheumatic poison. A fright or severe scolding may also be sufficient to start off an attack of chorea in a nervous child, and sometimes imitation of an affected comrade seems to be responsible for the attack. A very severe form of acute chorea sometimes occurs in women during or after pregnancy. The characters of the movements are as follows. They are involuntary, but are increased by any excitement or by any voluntary effort; they are jerky, and absolutely lacking in rhythm, every muscle seeming to have a will of its own, contracting when and how it likes; they are usually more marked on one side than on the other. At first they might well be described simply as "fidgetiness." As regards the face movements, they may be described as grimaces, with winking of the eyelids and twitching of the corners of the mouth; and, if the tongue is put out, it is often jerked out and as quickly drawn in, and sometimes the lower jaw is involuntarily closed, biting the tongue severely. The patient can usually swallow quite well. In bad cases the movements of the limbs may be so violent as to bruise them, or even to throw the patient out of bed. The movements disappear during sleep. Prolonged or severe attacks lead to considerable exhaustion, and, if the movements are so marked as to prevent sleep, mania may occur. This is particularly liable to happen in those cases associated with pregnancy. Attacks usually subside in from six to ten weeks, but recurrences are very common.

Treatment.—The onset of an attack can sometimes be anticipated—*e.g.* when a nervous, high-strung child begins to suffer from headache, dreams of school-work, is fidgety, irritable, and not up to the mark either physically or mentally. Stoppage of all work, rest in bed for a week, and afterwards at home for a week or two, in such a case, will probably prevent the attack from coming on. In the belief that the disease is a rheumatic one, 5 grains of salicylate of soda may be given at this stage, thrice daily, while the child is in bed, giving it either as a powder or dissolved in water. This drug is not of service when the attack is fully developed. If the case is only seen or recognised after the movements are well developed, further measures will be necessary. In mild cases it will suffice if the child is kept at home and out of doors as much as possible; in severer cases confinement to bed is necessary. In both instances the child should be removed from all sources of excitement and annoyance, such as being laughed at or mocked by other children. There must be no excitement of any kind; sometimes complete isolation is necessary. The diet should be fluid or semi-solid, nourishing and abundant—milk, eggs, soups, jellies, fish-cream, pounded meat, beef juice, &c. The movements should not be actively restrained, nor must the child be scolded for not keeping quiet. The violence of the movements may be diminished by surrounding with pillows, and, if necessary, the bed may be made up on the floor. No medicines seem to have the power of cutting short the duration of the attack, although it is customary for some form of arsenic to be administered. If there is sleeplessness, a good plan is to use a hot pack night and morning—*i.e.* wrap the child in a blanket wrung out of very hot water. This is often followed by a refreshing sleep. Sometimes sleeping-draughts have to be given, but the ordering of these must be left for the doctor. Throughout the illness, the bowels, which are often obstinate, should be kept well opened by the use of one or two grains of grey powder at night, or by enemata. When the attack is over there is often considerable exhaustion, and during convalescence iron and arsenic tonics are likely to be of service; but as the use of arsenic always requires care and supervision, no prescription for it is given. Massage and Swedish exercises are often advisable to tone up the muscles.

Conditions allied to Chorea.—There are several conditions allied to chorea, or, at all events, somewhat similar to it in their movements, about which a few words must be said; but much is not required, as they are all rather rare conditions.

(1) *Chronic Chorea.*—There is a chronic form which is found only in certain families. It begins in middle life with irregular choreic movements and slurring speech, and the victims of this form all become insane. No treatment is known to have any effect.

(2) *Senile Chorea.*—Occasionally in old people choreic movements develop. This form is not hereditary, nor is there any mental deterioration; neither is it a rheumatic form. The movements once started will probably continue, but they are seldom severe enough to disturb the patient at all.

(3) *Epidemic Chorea.*—This, the original St. Vitus's dance, dates back to the Middle Ages. It consists, or consisted, of dancing, jumping, and gesticulating, associated with great religious excitement amongst pilgrims, and in all probability the disease was really a form of hysteria. The condition is sometimes seen in an occasional individual even at the present day, being dignified with the name of "saltatory spasm." This is certainly hysterical.

(4) *Habit-spasms, &c.*—These are very apt to occur in nervous persons, especially children. They may consist of nodding or jerking movements of the head, twitching of the corners of the mouth or of the ears, shrugging movements of the shoulders, or other peculiarities which become a habit to the individual. They may be learned in odd ways, but, once acquired, are very difficult to get rid of. They become more marked when the person is tired or nervous, and, in the case of facial contortions especially, may be a source of great annoyance both to the individual and the friends. They are indications of emotional overstrain, and are best treated by procuring freedom from all emotional excitement, and securing a quiet life in an open atmosphere. Scolding only makes the condition worse, and bribery is equally inadvisable as a mode of treatment. The more the child's attention is drawn to them the worse they become. The less notice that is taken of them the better, and, if the underlying causes of mental overstrain can be removed, they will gradually subside. In older subjects practising self-control of the movements before a mirror is often helpful.

Circulation, Disorders of the.—See HEART DISEASES, and ARTERIES, DISEASES OF THE.

Clap.—See VENEREAL DISEASES—*Gonorrhœa.*

Claw-hand.—See DEFORMITIES.

Cleft Palate.—See DEFORMITIES.

Club-foot.—See DEFORMITIES.

Cold in the Head.—The symptoms of cold in the head, an acute catarrh of the mucous membrane of the nose, are so familiar to most people as scarcely to need description. Coddling in children is one of the surest ways of rendering them susceptible to taking colds. The direct cause of the cold is usually the entrance of germs through a chill (see CHILLS), or, in many cases, infection from other sufferers; hence the frequency with which they are caught after being in some stuffy, crowded meeting, a theatre, church, &c. Some fevers, be it remembered, such as measles and influenza, often begin with a cold in the head, the cold being merely a part of the more general disease. The attack usually begins with sneezing, a dry, burning feeling in the nose, and loss of the sense of smell. Then there follows a profuse watery and mucous secretion, followed later by a thicker and more sticky muco-purulent secretion. The swelling of the membranes of the nose causes the familiar change in the voice. The catarrh often spreads from the nose up the tear-ducts to the eyes, causing them to become red and watery; into the frontal sinuses (see NOSE, DISEASES OF THE), causing headache above the eyes; to the throat, causing sore throat, or laryngitis; to the bronchial tubes, causing bronchitis, or cold in the chest; and sometimes to the stomach, setting up an acute dyspepsia. The swelling of the membrane in the nose may also block up the opening of the eustachian tube leading to the ear, causing deafness.

Treatment.—Much may be done to avoid colds by a healthy mode of life. The clothing should be warm but not too heavy, and, in particular, the neck should not be kept constantly muffled up; reserve that for a really cold day. The hands and feet are the parts that should be kept thoroughly warm and dry to prevent chill. The healthy action of the skin should be promoted by a daily morning tub in cold or tepid water, followed by a good brisk towelling. Common sense must of course be employed with regard to this as well as with any other measure. Some persons are too delicate to stand a cold bath, and no one should stay in till they are blue and shivering. A few seconds is often quite sufficient, and the temperature of the bath should not be so low that no reaction follows on towelling. That really is the test of its efficacy—that a warm glow should follow on rubbing down afterwards. The window of the bedroom should always be open—at the very least a few inches from the top. Draughts are not to be feared in bed if there be a sufficiency of blankets, and if the window be wide enough open; but they should be avoided when sitting, especially if heated or tired. Hot, stuffy rooms are also to be avoided; the infection of the cold is much more often got there than in the cold passages outside the rooms.

Poorly nourished children require good feeding and cod-liver oil. If constantly catching colds they should be examined for adenoids. (See

ADENOIDS.) In adults who are frequent sufferers the nose should be examined, as there are often found polypi, thickenings of the membranes, &c., which may require removal; and in some cases where it is found that the cold is always due to some particular germ, extremely good results have followed the administration of a vaccine against that organism.

For the actual attack, in the earliest stage, before the secretion has actually begun, but while the patient feels that a cold is coming on, the attack can not infrequently be cut short by a hot bath, hot drinks, and, to increase the perspiring action of these, a dose of Dover's powder at bedtime (5 to 10 grains, according to age), or a dose of 10 grains of salicylate of soda, in powder or solution.

Another remedy, successful in some persons at this stage, is quinine. A teaspoonful of the ammoniated tincture should be taken every two hours for three doses; do not take more, or for a longer period, else it may cause a horrid headache and ringing in the ears worse than the original cold. Ten drops of spirit of camphor on sugar as a single dose is another favourite remedy. All these are mentioned because, although none is absolutely certain, all succeed at times, and one will act in one case, another in another. Whenever possible the patient should remain one day in bed and another in the house. When the secretion has commenced, if the patient can remain in bed or in one warm room, inhalation through the nose, for a few minutes every two or three hours, of steam from a jug of boiling water containing a little Friar's balsam or a little menthol solution is the best measure. The diet should not be heavy, and it is generally advisable to give a purge, such as a grey powder (1 to 3 grains, according to age) in a child, or a blue pill (2 to 3 grains) in an adult. If the individual cannot stay in, menthol applied locally to the nose is probably the best measure. One of the best menthol preparations is that known as "coryfin." A little cotton-wool wrapped round a match should be soaked in this and well smeared round the inside of both nostrils. A small phial should be carried in the pocket, so that the menthol may be applied every two or three hours. In the third stage, when the profuse discharge is lessening and becoming more sticky, a nasal lotion will render it more easy to come away and hasten recovery.

℞ Bicarbonate of soda	2 grains
Borax	2 grains
Sodium chloride	2 grains
Water	2 tablespoonfuls

Dissolve. To be sniffed up the nose two or three times a day.

Nasal douche tablets may be obtained from many chemists whereby this lotion may be made up in bulk, and, instead of being sniffed up the nose, it may be kept in a douche-can with a rubber tube about two feet long and nozzle, and the nostrils douched out.

For colds in other situations see BRONCHITIS; THROAT, DISEASES OF THE; CHILLS.

Cold Abscess.—See ABSCESS.

Colic.—By colic is meant pain in the abdomen due to irregular and spasmodic contractions or cramp of the intestines. Simple colic is usually caused by the presence of something decomposing, irritating, or indigestible in the bowel. Unsuitable, bad, or imperfectly digested food is the commonest cause, especially in children. Severe constipation and the irritation caused by the accumulation of masses of fæces in the bowel may also set up colic, and so may drugs such as colocynth and jalap, which act as purgatives by setting up powerful movements in the bowel wall. Colic is also one of the features of chronic lead-poisoning. It must be borne in mind, however, that colicky pains are present as one of the symptoms of many serious diseases of the bowel—appendicitis, dysentery, ulceration, and obstruction from any cause. The important point in the diagnosis is not the recognition of colic—that is usually obvious enough—but the determination of the cause thereof, and whether it is a trivial condition or a serious one, demanding, often, prompt operation.

The pain varies from a slight ache to almost unbearable spasms, but in simple colic it is more spasmodic and less constant than when due to obstruction. It may be felt all over the abdomen, but is usually most marked round the navel. Pressure with the hand generally relieves simple colic (but not always, if there be much distension with gas), whereas it always aggravates the pain in the serious conditions. On examining the abdomen, it will be seen to be held somewhat rigid, but never so much so in simple colic as in obstruction. A rise of temperature points to something more serious than simple colic, and so does the presence of vomiting. The patient is usually constipated, but diarrhœa may follow, securing, when it does so, the removal of the irritant. During the attack the passage of a little wind per rectum is generally accompanied by disappearance of the pain. The diagnosis is sometimes clinched by the administration of a purge. This eventually cures simple colic, but intensifies the suffering in obstruction.

Treatment.—In any case where there seems to be a possibility of the colic being merely a symptom of some underlying serious condition, the sooner the doctor is called the better, but cases of simple colic can usually be treated satisfactorily at home. In adults relief will usually be obtained by taking a couple of drops of oil of peppermint on sugar, following it up by a tablespoonful of castor oil with 15 or 20 drops of laudanum. If the pain is great, it will be helped by the application of hot fomentations, poultices, or hot-water bottles to the abdomen. Rapid relief is often obtained by an injection into the bowel of 1 to 2 pints of soap and water. This may be combined with the castor oil, &c., by the mouth. In cases due to accumulation of fæces in the bowel such injections are essential, both in adults and children. Adults sometimes suffer more or less chronically from colic. In such cases more exercise is usually indicated; and if, as is often the case, the patient eats too much, the diet should be limited in amount. It will generally be found that such measures are not easily enforced at home, but a course at a spa such as Marienbad will often be cheerfully undergone.

Colic in hand-fed babies may be due to overfeeding, inappropriate diet, or to want of cleanliness in the feeding-bottle. Such matters must, of course, be remedied without delay. The attack of pain will often be relieved by turning the child over on its face, and can be arrested by the administration of 10 to 20 drops of sweet spirit of nitre in a teaspoonful of water, or by an enema of hot water slowly injected into the bowel. To prevent recurrence it is advisable to give a teaspoonful of castor oil to clear away any fermenting matter. A more obstinate form is sometimes seen in infants, both nursed and hand-fed, due to the milk being too rich. In this case the child shrieks with pain directly it has been fed. This can be cured by giving it two or three tablespoonfuls of fresh barley-water before feeding, so that the milk is diluted when it reaches the stomach. In older children the treatment of colic is on the same lines as for adults, only it is not advisable to give any laudanum with the castor oil, and the doses must be proportionately less. If of common occurrence, the dietary must be revised, diminishing the quantity of fermentable foods, such as sweets and starchy or farinaceous foods.

See also INTESTINES, DISEASES OF THE; and, for lead colic, LEAD POISONING. The terms biliary or hepatic colic, and renal colic, are used in connection with the passage of a stone from the gall-bladder, or from the kidney. These affections are quite different from true colic, and will be referred to under GALL-STONES and KIDNEY DISEASES.

Colitis.—Inflammation of the colon or large intestine. The leading symptom is diarrhœa, and the condition will be treated under that heading. (See also INTESTINES.)

Collapse.—The condition of collapse is most often seen after severe bodily injuries, such as crushing of a limb, or after any profuse loss of blood. A collapsed person is conscious, but, as a rule, lies unheeding unless questioned. The face is pale and drawn, the voice weak, the breathing shallow, the pulse feeble or even imperceptible, and the temperature sub-normal (96° F. or 97° F.). The more civilised and the more highly strung a person is, the more liable is he to suffer from collapse after any injury. Collapse is a state of exhaustion or temporary paralysis of the vital centres in the medulla of the brain. A closely allied condition is that of "shock" after surgical operations. A condition of collapse may also form the final stage of many serious diseases, but here, of course, we are dealing with a state of affairs different in origin and not amenable to treatment in the same way as collapse following on injuries.

Treatment.—The patient should be kept in bed in a quiet, darkened room, well covered, and surrounded with hot bottles; but be careful not to have them too hot, as such a patient is easily burnt. In cases due to loss of blood the patient's head should be kept low, and the limbs bandaged fairly tightly towards the heart, until a medical man can be obtained to carry out whatever other treatment may be necessary.

Coma is simply another name for unconsciousness so deep that the patient cannot be roused by any means whatsoever. It may be due to various brain diseases, especially apoplexy; to poisons, especially opium; to poisons manufactured inside the body, as in Bright's disease (uræmia) or diabetes; also sometimes to meningitis, sunstroke, or pernicious malaria.

Compression of the Brain.—See BRAIN, DISEASES OF THE.

Concussion of the Brain.—See BRAIN, DISEASES OF THE.

Congestion.—This takes two forms: (1) an active, acute form, which is the first stage of and accompanies all kinds of inflammation, being the cause of the redness which is one of the classical signs of inflammation; (2) a passive, chronic form, in which the blood-vessels become over-filled because of some weakness of the circulation. It becomes a serious condition when the lungs are affected, and is very often a sign that the heart is failing and that death is drawing near. (See LUNGS, DISEASES OF THE.)

Conjunctiva, Affections of the.—See EYE, DISEASES OF THE.

Constipation.—This is a chronic condition in which the bowels are opened too seldom or incompletely. This definition excludes complete absence of movement, or acute obstruction, which is a much more serious complaint. There is a general consensus of opinion that the bowels should move once daily in health, but it must be admitted that in some persons the normal movement is twice a day, while in others a motion once in two or more days seems perfectly natural and compatible with perfect health. Nevertheless one must have some standard to go by, and it may be held for the vast majority of persons, that if a good motion of the bowels is not obtained regularly, at least every other day, and preferably every day, and *that* without the use of medicine or other aids, that constipation exists.

The *causes* of constipation are numerous. In many cases it is simply a bad habit, which may be the result of careless upbringing and date from childhood, but is often due to the rush of modern life, which leaves no time for attention to the call of nature in the morning. Constipation may be aggravated by the habit of too constantly using medicines or injections to open the bowels. Lack of active exercise, which is one of the best aids to the onward movement of the contents of the bowel, is also another fruitful source of constipation. The diet has also a good deal to do with it, especially the absence of articles which leave a certain amount of solid residue to act as a stimulus to the movements of the bowel walls, such as oatmeal, brown bread, green vegetables, and fruits. A too dry diet also favours constipation, and a temporary constipation may often be noticed to follow excessive sweating, just as it may follow on any sudden change in diet, drinking-water, or in the habits of the individual. A lax abdominal wall, such as occurs in women after repeated pregnancies, or in stout persons who have become thin, and which gives no support to the intestines, also predisposes to constipation. Certain diseases, especially diabetes and any disease in which there is sluggishness of the liver, whereby the secretion of the bile, which is a natural stimulant to movement of the intestine, is diminished, produce marked constipation. Lastly, certain conditions of the bowel itself cause or tend to constipation—*e.g.* piles, or any painful fissure of the anus, which make movement so painful that the patient inevitably tends to put off the evil moment; tumours or strictures of the bowel causing partial obstruction; or compression of the bowel from the presence of a tumour in the pelvis, or by the pregnant womb.

Effects of Constipation.—Some persons seem to be able to allow constipation to go to dreadful lengths without suffering much ill effect, while others are rendered miserable if a single day's movement is missed; between these all degrees of variation exist. The chief results are due to absorption of the waste products into the circulation, and poisoning of the system by this bad blood. Headache, irritability, loss of energy, depression of spirits, bad breath, and furred tongue are amongst the commoner results. Chlorosis, or anæmia, is practically always associated with, if not actually due to, constipation, and appendicitis is another disease to which it predisposes. Locally constipation causes discomfort in the abdomen, sometimes colic; and piles, which are a cause of increasing constipation, are often brought on by inattention to the bowels to begin with.

Treatment.—The causes of constipation have been gone into very fully, because it is necessary to know the cause in order that the condition may be properly cured. In many instances it is reform of the mode of life which is needed, and not medicines, although medicine may be necessary for some temporary cases, or in the beginning of a cure of habitual constipation. In the first place, we would insist on the necessity of regular habits. Go to stool every day at some fixed hour, whether inclined so to do or not. After breakfast is the best time; but if that cannot be managed, some other will do. The desire may be aided by a few minutes' sharp walk, or, in men, by a morning pipe. A certain amount of daily exercise is also a necessity. Half an hour's or an hour's riding before breakfast or in the course of the forenoon is undoubtedly the best. This is beyond the reach of many; but, fortunately, the next best form of exercise, walking, should not be impossible for anybody, although, in these days of trams and motors, the habit and power of walking bids fair to be forgotten. Where, from age or obesity, natural exercise becomes difficult, or there is want of will to persist, its place may be taken to a certain extent by abdominal massage, the abdomen being rubbed round firmly with the hand, clockwise. When at stool it is a good plan for sufferers from habitual constipation to "squat," instead of sitting in the common attitude. The thighs support the abdominal wall better, so that force can be exerted more easily. Help is often given, also, by pressure with a finger between the end of the spine and the anus. The special diet that should be used by persons with a tendency to constipation should include either porridge or brown bread, and uncooked fruit or uncooked vegetables, such as salads and cress, at every meal. If these should cause indigestion or cannot be obtained, then use well-cooked green vegetables and stewed fruit. See that plenty of liquid is taken. A very good plan is to sip a tumblerful of cold water while dressing, and to drink something with each meal. Plain water is sufficient in most cases, provided that it is not a very hard water. Milk with meals should be avoided, as it is rather constipating. Tea and coffee should be weak, and China tea is better than the more astringent varieties from India and Ceylon. Spa treatment for constipation holds a considerable place; but, valuable though the waters are, it ought to be understood that a great part of the value of spa treatment lies not in any miraculous virtues of the water, but in the regular habits of exercise and diet which are there insisted upon, and that, if people will, they can quite as well carry out these principles at home. Only, it is made easy and pleasant at these resorts, and this is an age of spoon-feeding and not of eating strong meat! Of all the waters and spas, Marienbad probably stands first—in this country, Cheltenham—for the treatment of constipation. For the medicinal treatment of constipation there are legions of drugs available. For habitual constipation the type of drug required is one which will not do harm, which is mild and easily regulated, and reliable. On the whole, mineral waters or the salts which constitute their active base best fulfil these requirements, although they are too depressing to be taken for long by delicate invalids, and should not be taken in large amounts by pregnant women. Of these mineral aperients sulphate of soda is the pleasantest. The quantity required must be regulated by the requirements of each case. About a teaspoonful (or rather more, if the effervescent form be taken) dissolved in half a tumblerful of water, and sipped slowly in the morning, is a good dose to begin with; or a wineglassful of mineral water, such as Carlsbad, Hunyadi Janos, Apenta, &c. Fruit salts (which have in most cases only a very distant bowing acquaintance with fruits) have a similar action. Of the vegetable aperients, those most in favour are senna, cascara, and aloes. Senna is the mildest; it forms the chief constituent of compound liquorice powder, of which from a teaspoonful to a tablespoonful may be taken. A few pods of senna may be stewed with prunes and then picked out; the prunes and syrup form an agreeable mild laxative. Syrup of figs also owes its efficacy largely to senna. Cascara is a stronger and very suitable drug, as it acts as a sort of tonic to the bowel wall, and the dose can, as a rule, be gradually diminished. From 20 drops to a small teaspoonful of the fluid extract will be required, or from 2 to 6 grains in pill form, given at bedtime. In obstinate cases it may be given in rather smaller doses thrice daily before meals. Aloes, in one form or another, forms the active principle of many preparations, "patent" or otherwise. A splendid preparation, which may be taken at bedtime, consists of aloin (2 grains), extract of nux vomica (¼ grain), and extract of belladonna (½ grain). This can be obtained from most chemists as a "dinner-pill." Enemata, or rectal injections, are very useful in certain cases—*e.g.* in typhoid fever—where it is not safe to give purgatives, or where there is a big accumulation of fæces in the lower bowel; but their use is not to be recommended for habitual constipation, as they are very apt to cause a habit, and should not be used unless absolutely necessary. We have not referred to the use of strong purgatives, whose administration is best left to a medical man; but, to produce a single good clearing out of the bowel, such as is often very advisable at the beginning of an acute illness, or at an occasional odd time, there is nothing like mercury. A dose of calomel in the shape of a blue pill (2 to 5 grains, according to the strength of the individual) should be taken at night, and followed up by a saline draught, such as a Seidlitz powder, in the morning.

Castor oil is an excellent drug but for its objectionable taste, although this may be got over by taking it in capsules, or mixed with equal amounts of glycerine, or taking it in strong black coffee. It is mild, but certain, and very safe. It is particularly good when it is desired to get the bowels to move after they have been confined for several days, in which case from one to two tablespoonfuls will be required. In the constipation of old people it also acts well in doses of one-half to one teaspoonful. In children, although very suitable for occasional administration, it should be remembered that it has a constipating after-effect, and that its frequent use rather causes than cures constipation.

Constipation in Children.—Habit and regularity should be inculcated from earliest infancy, and in a sucking child this applies equally to the feeding. Feeding too often, whenever the child cries, easily sets up constipation. In hand-fed infants constipation is usually due to too firm clotting of the curd; this may be prevented by proper dilution, or by the addition of 1 grain of citrate of soda to each ounce of milk. In summer it is apt to be the result of too little fluid in the diet. Especially when the urine is noticed to be becoming scanty and high-coloured, allow the child to have half a tumblerful of cold water (boiled first) several times a day between meals. In infants at the breast a temporary constipation can often be relieved by the mother taking castor oil. A soap suppository (a small piece of ordinary yellow soap in the form of a pointed cone, about the diameter of a common lead-pencil) inserted into the anus is a common and satisfactory nursery remedy. The confection of sulphur, from one-half to one teaspoonful, is a very suitable laxative for somewhat older children. Many of the "elixirs," or syrups, which owe their sweetness to sugar, are not fit remedies for children, as they readily ferment in the stomach, and are fruitful sources of flatulence and indigestion. In the case of children after the age of infancy, a regulation of the diet and habits is exceedingly important. One great mistake is that children after weaning are fed too much on starchy and sugary matters. Chicken, fish, mutton and vegetables, and fruit should form part of the dietary—in moderation, of course—and they should be got to take wholemeal bread and to take porridge for breakfast. If costiveness has become a habit in a child, it will be necessary to give a mild laxative regularly at night till the habit of a daily stool is recovered. For this purpose cascara is the best remedy, beginning with a dose just large enough to move the bowels; then, paying attention to the diet and habits, gradually diminish the amount. For a single good clearing out, mercury, as in adults, is excellent; but in children the best form is a grey powder, of which from 1 to 3 grains, according to age, may be given in a spoonful of pudding or jam at night.

Consumption.—The term consumption is sometimes used synonymously with tuberculosis, or disease due to the tubercle bacillus, and which may attack almost any part or organ in the body. But, as a rule, when consumption is spoken of, tubercular disease as it affects the lungs is meant—pulmonary tuberculosis or pulmonary phthisis—and it is in this restricted sense that we will consider it here. For a consideration of tuberculosis in general, see under that heading, where also there will be found references to consumption, or tubercular disease, as it affects other organs of the body.

One of the main symptoms—as both the Latin-derived and the Greek-derived names, consumption and phthisis, indicate—is loss of flesh; the other leading symptoms are cough, sweating (especially at night), fever, and spitting of blood. The direct cause of the disease is, in every instance, the tubercle bacillus; but, seeing that many persons, perhaps all, are exposed to the possible infection by this organism, while only certain persons develop consumption, there must obviously be other factors come into play. One of these, and a very important one, is hereditary predisposition. The disease is not transmitted directly from parent to child, but the children of a phthisical parent, or still more so of phthisical parents, inherit a lack of vitality of the individual as a whole, and a poor development of the chest in particular, which render them very susceptible to the infection of tuberculosis. The long, flat, winged chest and typical appearance of such susceptible individuals is described under CHEST DEFORMITIES. In many of these cases there is also poor feeding, and it must also be remembered that the presence of adenoids or rickets in childhood or youth may lead to the same kind of defective development of the chest. This hereditary weakness is found not only in the children of parents themselves consumptive, but also in those of alcoholic parents.

Infection by the bacillus occurs, in about two-thirds of all cases, by direct inhalation. When a person with consumption coughs, the bacilli are disseminated in the sputum; this dries up, gets blown about, and, when inhaled by a susceptible person, the bacilli settle down in the lungs and set up the disease. Hence spitting is to be regarded not merely as a filthy, but as a highly dangerous, habit. The other main channel of infection is by way of the alimentary canal; this occurs, especially in children, as the result of drinking milk from tuberculous cows. The influence of age upon the incidence of phthisis is distinct, although no period of life is altogether immune. It is common in the first ten years of life, and again between the ages of twenty and thirty-five; but it is rarely seen *de novo* in older people, only when specially exposed to infection, or when some old tubercular spot, incompletely healed, breaks out afresh. The sexes are about equally affected. Employment is a factor of great importance. To begin with, it must be stated that the disease is much less common amongst the well-to-do, whose life is a comparatively easy one, than among the poorer classes, with perhaps harder work and stinted fare. Again, those who habitually live and work in close, ill-ventilated rooms are at a great disadvantage compared with those who lead an open-air life, or, at all events, keep their rooms well ventilated. Further, the amount of dust in the atmosphere is of great importance. Of all occupations, amongst those which most favour the development of consumption may be mentioned weavers, stone-masons, knife-grinders, file-makers, &c. Climate is not such a very important factor, except in so far as it may tend to cause people to live in unhygienic conditions as regards ventilation, &c., or the reverse; although it may be said generally that consumption is favoured by a moist, warm climate, or by a cold, damp, clay soil, whereas it is rare at high altitudes and in very dry climates. Certain other diseases predispose to consumption—*e.g.* infectious diseases which lower the vitality. Thus it is not uncommon to find consumption dating from after an attack of pneumonia, influenza, measles, or whooping-cough. Diabetes very often ends in a rapid consumption. Cancer, gout, and some forms of heart disease, on the other hand, are rather inimical to consumption. When a woman with consumption becomes pregnant, it often happens that the disease is quiescent during pregnancy, but after delivery it tends to become much more active.

Consumption of the lungs takes several forms, which require separate mention.

1. A very acute form, or "galloping consumption." This may be the termination of a more chronic or even quite latent consumption of the lungs or of some other organ, and is due to a tubercular focus breaking through into a blood-vessel or into a large bronchial tube, with consequent distribution of tubercle bacilli throughout the whole of one lung, or throughout both lungs, and sometimes over the whole body. In the latter case, in children especially, the lung symptoms are very likely to be masked by those of a tubercular meningitis. Such cases are very apt to occur after measles. This form of consumption begins almost as suddenly as an acute fever, and is at first very difficult to distinguish from such fevers as acute bronchitis, typhoid, or pneumonia. There is headache, profuse perspiration, rapid emaciation, rapid pulse and breathing, flushed cheeks, feverishness, a temperature rising to 102° F. or 103° F., but often swinging greatly, and cough; but the sputum is often not more distinctive than that seen in an ordinary bronchitis, often showing no blood and containing no tubercle bacilli. This form of the disease is always so acute and so difficult of diagnosis that a medical man must be sent for. It need only be said that this form of tuberculosis is almost invariably fatal in anything from three weeks to three months, and that very little can be done beyond relieving certain of the symptoms.

2. What may be called "ordinary consumption," a disease of great variety as regards its acuteness or chronicity. Two processes are going on in the lungs in this condition: (*a*) breaking down and cavity formation, (*b*) healing by fibrous tissue or scar formation. At any particular time, or in any one patient, the one process may have the upper hand or the other may; consequently the symptoms vary very much in different individuals, and in the same person from time to time. This form of consumption begins, or at all events shows itself first, in various ways. A neglected cold or series of colds which do not clear up may be the starting-point, and the continued cough the particular thing which first makes the patient suspect the possibility of consumption. Pleurisy is another common mode of commencement. The patient has a typical attack of pleurisy, but, instead of recovering completely, he passes on to have cough, sweating at night, and loss of weight, and examination of the lungs reveals the presence of consumption. Other cases begin more insidiously, with anæmia, loss of appetite, and loss of weight and strength, then rapid breathing and cough; or it may commence with dyspeptic symptoms, loss of appetite, pain or heaviness after meals, nausea, dirty tongue, and only after these features have lasted some time do the chest symptoms come on. Once established, the symptoms are loss of weight and strength, sweating (especially at night), fever, cough, and spit. The cough may be for a considerable time a dry tickling cough; then there appears some expectoration, first of clear glairy mucus, then yellowish masses appear in it, and it is in these that the tubercle bacilli are usully found on microscopic examination, and the finding of them absolutely clinches the diagnosis of consumption. Every now and again the sputum will be found streaked with blood, and sometimes considerable amounts of blood are spat up. A study of the temperature is of great importance in a case of consumption. The temperature is usually of the swinging, "hectic" type, rising considerably above normal in the evening, falling to about normal, or even below it, in the morning. If the temperature does not come down to normal in the mornings, it usually means that the disease is advancing; while, if it does, it means that the patient is at least holding his own, if not actually improving. Examination of the chest often gives positive signs on percussion and auscultation by the doctor, while flattening or hollowing above and below the collar-bone is often noticeable even to the most untrained observer. The apices of the lungs are the parts usually first and most severely affected, and the hollowing is due to falling in of the chest wall over the shrunken lung. All through the disease the mental state of consumptives, even to the very end, is one of hope; they are constantly buoyed up by the belief that they are recovering. Too often, alas, it is a fool's paradise in which they are living.

3. Fibroid phthisis, the most chronic form of all, is usually met with in men of strong bodily habit, and it may run a course of many years. In this form there is very little breaking down of the lung, but much scarring and contraction. The result is a shrunken, deformed chest, in which there is little expansion. The patient loses weight, but has little or no fever and no night sweats. He has constant cough, worse in winter, the condition differing only from chronic bronchitis in that every now and again there is some spitting of blood.

The *treatment* of these last two forms may be considered together. Firstly, *preventive measures* must be considered, and they can best be given in the form of brief statements. A phthisical mother should not nurse her children. Milk for children should always be boiled, because it is so very often tuberculous. Children should not be molly-coddled. They do not require to be so much exposed that they are hardened out of existence altogether, but they should get plenty of fresh air both day and night, and as much sunlight as possible, for sunlight is the deadliest enemy of the tubercle bacillus. The occupations chosen for persons with a consumptive heredity should be, if possible, out-of-door ones, or at least not too confined. The advisability of persons with consumptive tendencies going to some country with a warm, dry climate, where an outdoor life is easily attained (Egypt, California, South Australia, South Africa, &c.), should be very seriously considered. Consumptive persons, or persons of markedly consumptive families, should consider seriously whether it is morally justifiable for them to have children, seeing that the children not only inherit tubercular tendencies, but, living in a consumptive household, are almost certain to be frequently exposed to the possibility of inhaling tubercle bacilli. Consumptive patients must remember that they are infectious and a danger to the community, and that the chief danger lies in the sputum. The sputum should be collected in portable glass flasks containing some 10 per cent. carbolic solution, and destroyed. Handkerchiefs should never be employed, but, instead, rags or paper handkerchiefs which can be burnt. Patients should sleep alone, and the blankets and sheets, which are sure to become infected by coughing, frequently disinfected by boiling. On no consideration should any one with consumptive tendencies be allowed to nurse or even to live with any consumptive patient.

The general lines of treatment of an actual case will now be given, although it must be stated that there is no routine treatment suitable for every patient. Cases vary tremendously in their severity, and the advice and guidance of a physician skilled in the management of consumption should always be obtained. It is not so very long ago since consumption was regarded as a hopelessly incurable malady, but the modern view is quite different, for it is now known that Nature cures phthisis daily without the help of the doctor. Post-mortem statistics afford abundant proof of this, for nearly 50 per cent. of all dead bodies show some trace of consumption, and in a large proportion the consumption is cured. We regard consumption, therefore, as an eminently curable disease, provided that it is recognised and treated early enough. The main object of modern treatment is to increase the power of resistance of the tissues of the body against the tubercle bacillus; a certain amount, but much less, can be done to kill out the bacilli actually present in the lungs. A third object of treatment must, of course, be to relieve certain symptoms and complications as they may arise. The methods of increasing the patient's powers of resistance are few and easy of application if the *motif* be properly understood.

1. *Open Air and Sunlight.*—This is the most important of all. The patient should be bathed in fresh air, day and night, summer and winter. This applies to all stages of the disease. It is free from risk, and followed in almost every case by striking benefit. It is the foundation of all sanatorium treatment, and, although most easily carried out in a sanatorium, can, in most instances, be satisfactorily carried out at home. But in order that the patient should learn how to do it properly, it is strongly advised, if the patient cannot, from want of means or other cause, have full sanatorium treatment, that he should have at least a month in such an institution. The patient should be lying, sitting, or exercising, according to his condition, all day outside, but of course he can be sheltered from fierce winds and rain. This applies to winter as well as summer, only it is then necessary that he be kept warm by a sufficiency of warm wraps. At night, sleeping in open-air shelters is often advisable; if indoors, the room should be as free and airy as possible. No curtains or hangings are to be allowed. The bed should be close to the window, and the latter as wide open as possible in all weathers. There is absolutely no danger from draughts, provided only that the opening of the window be made large enough.

2. *Diet.*—Owing to the loss of appetite and indigestion, feeding is often a very troublesome matter in the case of patients treated indoors, but nothing is more remarkable than the rapidity with which the appetite returns when the patient is, so to speak, removed from the hothouse to the garden. There will be little call for forced feeding, for the patient often becomes voracious. The number and constitution of the meals must vary with the state of the patient. At first, probably, small quantities of light, easily-digested liquid food will be required frequently, but very soon the best diet for the patient may be summed up in the phrase, "three good square meals a day." Raw meat, in the form of fresh meat-juice, pounded meat sandwiches, &c., enters largely into the dietary in some sanatoria, and is often a useful addition to other foods, or, to a large extent, in place of them, where there is much digestive disturbance.

3. *Clothing.*—While the patient should be kept warm, he should not be overclothed. Most patients err on the side of overclothing, both in the daytime and in bed. Woollen garments are, as a rule, the best, and as some guidance it may be said that a single woollen shirt, or its equivalent, is usually sufficient under the outer garments. To keep the skin acting well, a morning dip in cold or tepid water, with quick, hard rubbing down afterwards, should be taken by all patients able to be up at all. If confined to bed, cold sponging and dry rubbing by an attendant should take its place.

4. *Rest or Exercise.*—This is entirely a matter to be settled by the condition of the patient. As a general rule it may be laid down that, if the temperature swings much or rises above 100·5° F., or if the pulse-rate keeps about 90 per minute, the patient should be resting completely. As the pulse and temperature improve, movement and exercise are very cautiously commenced and gradually increased. Walking is the best form of exercise to begin with—five or ten minutes per hour at first, resting the remainder of the time. The period may be gradually lengthened, and, with increase of strength, inclines, and finally hills, may be faced. Later, garden pursuits and mild golf may be allowed. Slow, deep breathing through the nose for a certain stated time in the open air should be practised at all stages.

5. *Drugs.*—These are not much required; the garden and the kitchen take the place of the dispensary; but to increase the resistance of the tissues certain drugs are helpful. One of the best is cod-liver oil, and most patients will benefit by the administration of from one to four teaspoonfuls of the pure oil or of the emulsion after meals twice or thrice daily. Malt preparations, either alone or in combination with the cod-liver oil, are also beneficial, and so is syrup of the hypophosphites in doses of from one to two teaspoonfuls after meals.

6. *Climate.*—This plays a much smaller rôle in the treatment than formerly, for the open-air treatment can be carried out in any climate. The

really important point is that, wherever the patient is or goes, suitable conditions of residence and life can be obtained on the lines laid down. Climate as such has no material influence either on the origin or course of the disease. Change of climate certainly may have a beneficial influence, but the only persons who should move are those who can travel comfortably, and in whom the disease is in an early stage.

Direct attack on the tubercle bacillus is much less efficacious in the treatment of consumption than the plan of improving the patient's powers of resistance. Something can be done, however, by the use of such drugs as tuberculin ("Koch's cure," and various modifications thereof), creasote, menthol, iodoform, &c.; but the use of these is only for certain suitable cases, and demands skilled judgment, so that further description would be out of place here.

Relief of Certain Symptoms.—In the old days symptomatic treatment was the main—nay, almost the only—treatment. Powerful drugs were given to stop the cough, to stop the sweating at night, to force an appetite, &c. Sometimes they succeeded for a time, but they did not cure the disease. Under open-air treatment it is remarkable how few symptoms require special treatment or relief. They one and all improve along with (what is much more important) the patient. It may safely be said that should there be any symptom so urgent or severe as to demand relief for itself, be it cough, spitting of blood, pain, fever, diarrhœa, excessive sweating, &c., there is either something wrong with the plan of life of the patient, or the condition is a serious one, and in either case the advice of a doctor is indicated.

Contracture.—This is the term applied to the permanent shortening which often occurs in muscles or their tendons as a result of paralysis of the muscle. Extreme flexion or bending, often with deformity, occurs at some of the joints, and the joint cannot be straightened out. Contracture also occurs sometimes in the fibrous tissue lying under the skin, especially in the palm of the hand, resulting in one or more fingers being immovably bent into the palm of the hand. Surgical measures are required to relieve contractures. (See also under DEFORMITIES.)

Convulsions.—By convulsions in children is meant an attack or fit in which the limbs and body are jerked and bent about in a spasmodic, irregular fashion. Sometimes the fit occurs quite suddenly; at others warning is given by facial contortions, rolling of the eyes, or grinding of the teeth. During the attack consciousness is usually, but not always, lost. The fit may last only a minute or less, or it may be much more prolonged. It may be single, it may recur at indefinite intervals, or the child may pass from one convulsion into another. This condition is not a disease in itself, but only a symptom of some other trouble. Convulsions may be due to the most trifling causes, or they may be of very serious import; but, irrespective of their origin, they may lead to serious results if prolonged. Generally speaking, however, they are seldom fatal, and are not nearly so serious as they are alarming to see. The term "inward convulsions" is sometimes used when the infant only rolls its eyes, moans, clenches its fists, or draws up the legs. Fits or convulsive seizures occurring in older children, or in adults, may be due to epilepsy, hysteria, brain tumours, general paralysis of the insane, or eclampsia in pregnancy.

Causes of Convulsions.—(*a*) In the newly-born they may occur where the labour has been prolonged and difficult; they are then usually due to hæmorrhage on the surface of the brain, and, if not fatal, will result in paralysis and mental deficiency. Such cases are now sometimes treated very successfully by operation and clearing out of the clot of blood.

(*b*) Before the period of teething, if not due to meningitis, they are usually traceable to improper food or over-feeding. In children of a nervous stock, or of parents of poor physique, very trivial disorders of digestion will cause convulsions. In such cases a dose of castor oil with one or two drops of laudanum in it will stop them, and prevent recurrence if suitable diet be provided.

(*c*) Teething is often set down as the cause of convulsions, and sometimes it may be so, but not nearly so often as is thought. In healthy children whose gums are also healthy, teething is a painless process. It is only painful when the gums are swollen and inflamed. Now, such a condition of the gums is practically always associated with, if not actually due to, stomachic disturbance, with vomiting, colic, &c.; the child is fretful and feverish, and in all probability overfed; its sufferings are aggravated by, and the convulsions are due to, the colic, not to the teeth. Gum-lancing is justifiable when, in the case of convulsions, the gum over the erupting tooth is swollen and painful, but not otherwise. The proper treatment is again castor oil, and a diet of milk only, well diluted with barley-water until the stomach and bowel catarrh have subsided. The gums in such a condition should be rubbed gently over several times a day with glycerine of borax containing chlorate of potash, 10 grains to the ounce.

(*d*) Convulsions coming on after the period of teething and during early childhood are again most commonly due to colic from improper or excessive feeding. But other things are now also occasionally the cause of convulsions. Amongst them are such conditions as intestinal worms, astigmatism or other errors of refraction in the eye, wax or foreign bodies in the ear or in the nose, adenoids, a long or tight foreskin in boys, excessive crying, excessive coughing as in whooping-cough, the onset of some acute illness or fever—convulsions in children seem to be equivalent to rigors or shivering fits in adults under such circumstances—a fright, or, lastly, rickets.

When a child takes a convulsion, the best thing to do is to put it into a warm bath with a little mustard sprinkled in, and send for the doctor. It is also permissible and advisable, especially when there is feverishness, to apply ice or cloths wrung out of cold water to the head while in the hot bath. The further treatment will depend entirely on the cause of the convulsions. If these persist, it may be found necessary to give a little chloroform, or, after washing out the bowel, to give sedative injections of such drugs as chloral. It is not advisable to give emetics to produce vomiting, but a good dose of castor oil never does any harm, and often has the best effect when given after the actual convulsion has ceased.

Corns.—These are so familiar as not to require description. They are due to the pressure of tight or ill-fitting boots, or, on the under surface of the foot, to unevenness in the sole of the boot. There is no essential difference between a soft and a hard corn; in both there is, as a result of the irritation, thickening of the superficial horny layer of the skin, and an actual ingrowth of this layer into the deeper layers of the skin. This is sometimes known as the root or eye of the corn, and can usually be seen in the centre of a corn after paring, as a depressed opaque white spot. Soft corns only differ in being sodden with moisture; they are commonest between the toes. To get rid of corns permanently, it is of course essential that the footgear should be rectified so as not to be tight. For corns between the toes, stockings with separate compartments for each toe will be found serviceable. The best application for corns is salicylic acid. All the corn plasters and corn cures contain this in one form or another, but a thorough cure in one or two nights is impossible. A good formula for the application is:

℞ Salicylic acid	½ drachm
Extract of cannabis indica	½ drachm
Flexile collodion	½ ounce

Soak the foot one night in warm water, and with a knife or razor pare away the surface of the corn. Dry, paint on some of the salicylic collodion, and repeat every night. In about a week a considerable part of the thickened horny skin should separate. This is not enough, and here is where most people make a mistake—in stopping at this stage. To get thoroughly rid of the corn the painting nightly should be renewed again and again until the surface is quite level; four times at least will be necessary. In a few cases, where the central root has gone very deep below the skin, it requires to be excised by the surgeon's knife before a complete cure can be obtained. But remember, prevention, in the form of properly fitting footwear, is far better than cure.

Cornea, Diseases of the.—See Eye, Diseases of the.

Corpulence.—See Obesity.

Coryza.—See Colds.

Costiveness.—See Constipation.

Cough.—In the great majority of instances cough is due to something wrong in the respiratory system—larynx, windpipe, bronchial tubes, or lungs—sometimes to conditions outside the respiratory organs. A dry cough, with little or no expectoration, occurs in the first stages of bronchitis, consumption, asthma, whooping-cough, influenza, and pneumonia, also in pleurisy; inhalation of dust or irritating fumes; or from the tickling of a long uvula. A single, slight, dry cough, frequently repeated, is the "hacking" cough of the earliest stages of consumption.

A loose cough with abundant expectoration occurs in the later stages of the diseases first mentioned above, and in some other lung diseases.

Cough coming in fits or paroxysms is seen most characteristically in whooping-cough. A paroxysmal cough with long intervals between may be due to cavities in the lung. Under such circumstances large amounts are expectorated in a short time, the cough ceasing until the cavity fills up again.

Laryngeal Cough.—This is dry but hoarse, ringing or "brassy" in character. It may be due to laryngitis, croup, or to food particles going in "the wrong way." The monotonous croaking cough sometimes due to hysteria is also laryngeal, and so is the cough met with in some cases of aneurism of the aorta.

Suppressed cough is a sign that coughing is painful or exhausting, as in pneumonia, pleurisy, and peritonitis.

Winter cough, disappearing in summer, means either chronic bronchitis or a very chronic form of consumption.

Cough due to conditions outside the respiratory organs may come from hysteria, wax in the ear, adenoids, long uvula, aneurism, or heart disease. "Stomach cough" is found at times in the subjects of chronic gastric catarrh.

The treatment of cough depends on the cause, for intelligent treatment should be directed towards removing the cause and not merely suppressing the cough. If very incessant and troublesome, sedative drugs (usually some preparation of opium or morphia) may be necessary; but it is by no means always safe to check cough by these means, especially in children and old people, and should not be done without a doctor's advice. We would merely say that in the great majority of cases great relief is given to a cough if the air inhaled be moist. This can be accomplished by having a kettle with a long spout projecting into the room, or by inhaling occasionally the steam coming off a jug of boiling water. For further details see under Acute Bronchitis. The various diseases mentioned as causing cough may also be consulted, and the section on Expectoration.

"Courses," Disturbances of the.—See Menstruation, Disturbances of.

Cow-pox.—A disease of the udders of cows which is communicable to man. A person who has had cow-pox is thereby rendered immune to small-pox, a fact which is the basis of vaccination.

Cramp is a painful muscular spasm, affecting muscles of the limbs, and, more rarely, of the trunk, and of internal organs. It usually comes on suddenly; the pain may be agonising, and the affected muscle can often be felt gathered up into a hard knot. As a rule the cramp passes off quickly. Rheumatic persons are very liable to cramp. The attack may be due to lying in some uncomfortable or strained position when asleep, and is perhaps then due to insufficient blood-supply to the muscle. There is a form of intermittent cramp or limp due to the disease of the arteries making the blood-supply deficient; this is often associated with excessive smoking. Exposure to cold may cause cramp, as in swimmers. Over-exertion in persons who are not in training is a very common cause; stitch in the side is probably a cramp of the diaphragm belonging to this class. Very severe cramps occur in cholera, strychnine poisoning, lock-jaw or tetanus, and in the tetany of rickety children. (See these conditions.) A sudden vigorous stretching of the limb by the individual himself, if he can do it, will often terminate a cramp. If he cannot, the limb should be stretched and rubbed energetically, and, if practicable, a hot bath will usually be found to make the spasm give way. The subjects of intermittent cramp should consult a medical man to see what can be done in the way of obtaining more permanent relief from the recurring limp.

Cramp of the stomach, or gastralgia, accompanies almost any severe form of stomach trouble. (See STOMACH, DISEASES OF THE.)

Cramp of the intestine is simply colic (*q.v.*).

Writer's Cramp, &c.—There are a whole group of occupation spasms, cramps, or craft palsies which occur in persons whose occupation entails the constant repetition of certain fine movements. This condition is seen, perhaps, most frequently in persons who write a great deal, hence the name; but it occurs also in pianists, violinists, telegraphists, typists, glass-cutters, milkers, hammer-men, &c. The symptoms are, in the first instance, a gradually increasing difficulty in carrying out the movements required for the work in hand. At first this can be overcome by perseverance, but later the attempt brings on a painful cramp or spasm, which renders execution of the particular movement impossible. The striking point is that the affected muscles are quite normal for all other movements; thus, in writer's cramp the individual may be able to play the piano or wield a hammer quite easily. The condition is really a brain fatigue, an exhaustion of the particular cells in the brain which control the movements in question. It never comes on while the sufferer is learning his occupation, but after he has become expert and has been performing the particular skilled movement for a long period.

Treatment is always tedious. Drugs are valueless, except, perhaps, tonics if the patient is generally run down. The essential is complete cessation from the particular work which causes the cramp, and this is often very hard to obtain when a person's livelihood depends upon it. Diminution of the amount of the work will not do; it must be given up entirely for three months at the very least. Then, on restarting, it is necessary to work in a different way. Thus, in writer's cramp one sometimes advises a thick penholder held between the first and middle fingers, or a mechanical penholder strapped on to the forearm, so that writing has to be performed from the elbow. Other forms of professional cramp must be treated on the same lines, complete rest being the first essential. Unfortunately it happens not infrequently that the condition is so fixed that the only thing left for the patient is to change his or her occupation.

Cretinism.—Cretins are hideously ugly, dwarfed idiots, seen most frequently in certain mountain valleys in the Alps and elsewhere, but also cropping up sporadically in all countries. The condition is one very amenable to treatment if recognised early enough, and affected children should now never be allowed to grow up into, or rather become, cretins. The condition is due to disease or absence of the thyroid gland in the neck; but, if thyroid be administered, the development of the child may take place just as perfectly as in normal children. Although congenital, the condition is seldom noticed until the child is about a year old, it being thought merely backward. It may be suspected if growth is stunted, the face flat and heavy, the lips thick and coarse, the tongue large and protruding, the skin yellowish and dry, the skin over the abdomen loose and pendulous, the hands stumpy and covered with redundant skin. As time goes on the diagnosis becomes easier, for the child does not develop either mentally or physically, so that a cretin of fifteen may be no further developed than a healthy child of two. The treatment consists in the administration of thyroid gland substance in some form or other. The amount may be watched and controlled by a doctor, because it is easy to do harm by giving too much. If begun early enough, as mentioned above, development may go on perfectly; but, even where the condition has gone unrecognised and untreated for some years, great improvement can take place, but the mental improvement usually lags behind the physical. It will be necessary for the individual to take a certain amount of thyroid throughout life, otherwise the allied condition of adults—myxœdema (*q.v.*)—will come on.

Croup is the name applied to a sudden attack of breathlessness and harsh cough coming on suddenly, usually at night, in young children. The condition is a catarrhal laryngitis with spasm, the disease practically only taking this form in children between the ages of one and four. There has usually been a chill beforehand, and perhaps for a day or two a cold in the head and a little sore throat, but the child goes to bed and to sleep much as usual. In a few hours it wakes up suddenly in considerable distress, with the face flushed, sweating, laboured noisy breathing, and a paroxysmal brassy cough. The condition is so alarming that the doctor is hurriedly sent for. When he arrives the child is usually sleeping quite quietly and with no embarrassment in the breathing, for the spasm usually passes off in half an hour or less, although it may last longer, and second or third attacks may come on the same night. During the next day the child shows little wrong, but another, usually less severe, attack is common the ensuing night. A little hoarseness and cough are common for a day or so, and there is usually some bronchitis as the laryngeal catarrh subsides. The condition is sometimes confused with the far more serious "membranous croup," which is really diphtheria of the larynx. In the latter condition the onset of the serious breathlessness is usually preceded by a greater degree of sore throat from the diphtheria about the tonsils, and there is not the rapid disappearance of the spasm; that alone is sufficient to distinguish ordinary croup.

The outlook is favourable, but there is great tendency to recurrence. Only in very weakly children has it been known occasionally to be fatal from suffocation.

Treatment.—The child should be put into a warm bath to which has been added about an ounce of mustard. A teaspoonful of ipecacuanha wine may be given as an emetic. A tent should be formed by holding a blanket over the child in the bath, so that it inhales the steam. Warm drinks may be given freely, and, when the child is put back in bed after the spasm is over, a bronchitis kettle in the room or occasional inhalations of steam from a jug of boiling water is advisable, so long as there is any hoarseness. If the spasm does not yield readily when the child is put in the bath, there should be no delay in sending for the doctor, if he has not already been sent for, because surgical measures may in that event be necessary. For two or three nights following an attack a dose of antipyrin (1 grain for every year of the child's age, up to a maximum of four, in powder) should be given at bedtime to prevent recurrence of spasm. To prevent recurrence of attacks, the child should not sleep in an unwarmed room, and the throat may be hardened by daily sponging with cold water, and the child gradually accustomed to open air and free ventilation. (See also under DIPHTHERIA and THROAT, DISEASES OF THE.)

Curvature of the Spine.—See SPINE, DISEASES OF THE.

Cystitis.—See BLADDER, INFLAMMATION OF THE.

Cysts are tumours or swellings composed of a sack or membrane filled with fluid or semi-solid material. They occur in various parts of the body, and arise in various ways. Most of them are slow and gradual in their formation, painless, not dangerous, but often disfiguring from their position or size. Their cystic nature can usually be told by their elastic fluctuating feeling, although sometimes the sack is so tightly stretched that they feel hard and solid.

One group of cysts is due to errors of development. Of these the most important are the cysts which grow in connection with the ovaries of women, and which sometimes attain enormous size, taking, however, years to do so. A similar cystic condition may occur in the kidneys: in this instance the condition may be present before birth, and, if marked, is scarcely compatible with life. Dermoid cysts, which form in various parts of the body, are curious structures containing skin, hair, and even bones and teeth. Although present from birth, they may only become prominent in later life.

Another group of cysts owes its origin to the blocking up of some duct and accumulation of secretion behind the obstruction. The most familiar examples of this type are the wens seen under the skin, especially about the head or face—egg-like swellings. They are due to blocking of the outlet of a sebaceous gland in the skin. Blocking of a salivary duct causes the formation of a ranula, a little clear swelling under the tongue. Cysts in the eyelids result from the blocking of a meibomian gland duct. Cysts form occasionally in the breast, from the obstruction of a milk duct as a result of chronic inflammation. A somewhat similar condition is that known as ganglion, a little swelling in connection with a tendon or sinew, and seen most commonly at the back of the wrist. (See GANGLION.)

Hydatid cysts, usually found in some of the internal organs, are met with chiefly in persons who have much to do with sheep and dogs. They are due to a parasite which is the larval stage of a tapeworm found in these animals. (See PARASITES.)

Lastly, cysts may form by the breaking down of other forms of tumours originally hard and solid. In these the outlook depends on the nature of the original growth—whether it be of a simple, nonmalignant nature, or cancerous.

It should be mentioned that inflammation may occur in all kinds of cysts, which may render serious an otherwise non-dangerous condition. The best treatment for all kinds of cysts is surgical removal. As a rule, if completely dissected out, there is no recurrence. Sometimes they can be cured by injecting substances into them.

Dandruff.—See BALDNESS.

Dandy-fever.—See DENGUE.

Deaf-mutes, in the great majority of cases, are mute and cannot learn to speak because they are deaf, and the deafness is incurable because it is the result of a malformation of some essential part of the hearing apparatus. Speech can be acquired by the teaching of lip-reading, and the tuition of a deaf and dumb child should be begun in a special institution for the purpose about the age of five years. The marriage of deaf-mutes should be discouraged, because there is a strong tendency for the condition to be hereditary.

Occasionally, in those few cases where the deafness is due to chronic "running ears" or to adenoids, the deafness may be so improved by treatment that speech can be acquired in the normal way. It is always important, therefore, to have the ears carefully examined, in order to ascertain to what the deafness is due.

Deafness.—This may be a symptom of disease in any portion of the auditory apparatus, and, although the recognition of the cause of deafness is in many instances a matter which requires the services of a specialist, still it may serve some good purpose to indicate which are the chief conditions leading to deafness. These conditions can be conveniently grouped into three:

1. Those affecting the outer ear or canal leading into the drum or tympanic membrane. These are, as a rule, easily seen, and are generally removable. The commonest is a plug of hardened wax in the ear; others are boils, eczema, foreign bodies or insects, and tumours. The causes of *wax accumulating* in the ear are not fully understood; certain it is that it may do so in persons who are scrupulously clean as well as in those whose habits are rather the reverse. Plugs of wax may be present in one ear only, or in both. A certain amount of ringing in the ear is usually present as well as deafness. Sometimes, and that even before it has accumulated to such an extent as to cause deafness, it causes giddiness, and sometimes sickness and vomiting whenever the sufferer goes in a train. The mass can, as a rule, be easily removed by syringing; but this should only be done by a medical man, as considerable harm can be done to the drum by rough or unnecessary syringing. The removal is facilitated by softening the wax the day before syringing. To do this, dissolve a large pinch of bicarbonate of soda in a tablespoonful each of glycerine and water mixed. Put the head on one side, and have a little of the solution warmed and poured into the ear. Keep in for a quarter of an hour, and do this three times that day.

Boils in the ear are so painful as practically always to require incision, often under an anæsthetic. If incision is impossible, then poultices may be applied over the ear until the boil bursts. As recurrence is common, especially after poulticing, when the boil bursts plugs of cotton-wool soaked in 1 in 20 carbolic lotion should be inserted into the ear for ten minutes several times a day for a few days.

Eczema localised to the canal of the ear is not infrequently due to the bad habit of picking the ear. Once started, it is rather difficult to get rid of, and the thickening of the skin leads to partial deafness. It causes almost intolerable itchiness, but, if scratched, it only renders the eczema worse. Partial relief from the itchiness, at all events, can be obtained by rubbing firmly in front of and behind the ear. As the discharge from the eczematous surface is often very offensive and difficult to get rid of, we would advise early consultation with a medical man, rather than trying this, that, and the other thing, probable failure to get rid of it, and waste of valuable time by allowing the condition to become chronic.

Foreign bodies or insects, unless they be alive, do not from their presence alone cause much discomfort beyond the deafness. The danger lies in rough and unskilled attempts to remove them. Living insects—which cannot get into the brain, as is sometimes feared—are best treated by blowing a little chloroform vapour into the ear. If this cannot be obtained, then put the head on one side and pour in some oil, such as olive oil or parolein. The insect either comes out of its own accord, or is killed and can be syringed out. Other foreign bodies, if loose, can be picked out; but, if at all tightly wedged in, had better be left alone, because attempts to get them out without suitable appliances are only too likely to force them further in, and perhaps to do irreparable damage to the drum and middle ear.

Tumours, which are not common, must, of course, be removed surgically.

2. Deafness may be due to affections of the middle ear—*i.e.* of the drum, the small tympanic ossicles, and the chamber in which these lie: the sound-conducting apparatus. If it be remembered that this chamber communicates with the back of the throat by a tube called the eustachian tube, the source of most middle-ear deafness will be explained. By blocking up of this tube the free access of air into the middle ear is interfered with, the drum cannot vibrate properly, and hence the deafness. This explains the deafness in adenoids and in cold in the head, the swelling obstructing the mouth of the tube. This deafness usually subsides with the cold. Sometimes, however, and especially if there has been a bad sore throat as in measles or in scarlet fever, acute inflammation of the middle ear results from extension of the inflammation. There will be severe earache in this instance. A more chronic inflammation of the middle ear may come on insidiously in weakly children. Middle-ear disease is always a serious condition, not only because of the danger of the hearing being lost, but because the affection may spread through the floor of the skull and set up meningitis or abscess of the brain. (See Ear, Diseases of the.) In deafness due to affections of the middle ear it is a peculiarity that the person can usually hear better when in a noisy place, such as in a train or near heavy traffic.

3. Deafness due to affections of the inner ear, or sound-receiving apparatus, is practically beyond the reach of treatment. Fractures of the base of the skull may damage this part of the ear; hæmorrhage into it may occur in the course of certain fevers; some drugs, if taken to excess, may cause a temporary deafness, along with ringing in the ears, from their action on the inner ear. Quinine is the most familiar example of this; salicylates may have a similar effect. Persons who work in a constant noise, such as boilermakers, or who are exposed to loud reports—*e.g.* artillerymen—are apt to become gradually deaf. The only treatment is preventive by the wearing in the ears of good-sized plugs of a substance known as "clay-fibre." The gradual deafness coming on in elderly persons is often due to thickening of the inner ear.

Various artificial aids can be obtained for deafness—speaking-tubes, trumpets, more elaborate electrical apparatus which magnify the sounds, &c. They require to be experimented with individually to find out a suitable one. For ruptured drums a little plug of rolled-up cotton wool pushed well in makes probably the best of all artificial drums. (See also Ears, Diseases of the.)

Decline.—A term applied to the weak state induced by consumption.

Deformities.—*Head: Wryneck*, in which the side of the head is drawn down towards one shoulder, whilst the face is turned towards the sound side, is a condition sometimes present at birth, while in other instances it comes on later, from spasm or cramp of various muscles on one side of the neck. In most cases operation offers the only chance of putting the head straight, but even that is not always satisfactory. In *cleft-palate* the two sides of the roof of the mouth do not grow together properly, with the result that there is a cleft down the middle of more or less of the whole of the soft and hard palate. If allowed to go untreated it causes considerable difficulty in feeding in early life, and, later, causes a characteristic defect in articulation. The condition should be remedied by operation, if possible within the first three months after birth. If too wide for operation, its effects can be diminished in later life by wearing an artificial palate. Often associated with cleft-palate, but also occurring independently of it, is *hare-lip*, in which condition there are one or more fissures in the upper lip. These may only involve the lip, but they may also extend through all the structures of the upper jaw, and open into the floor of the nose. The only treatment is by means of operation, which should be done within three months of birth. Sometimes it has to be done within a few days of birth, owing to the impossibility of getting the child to feed.

Deformities in the shape of the head result chiefly from rickets (*q.v.*).

Spinal Deformities.—See Spine, Diseases of the.

Chest.—See Chest Deformities.

Upper Extremity.—For *high shoulder* see under Spine, Diseases of the: Lateral Curvature.

Claw-hand, a deformity of the hand in which it becomes like a claw in shape, may result from injury to the nerves of the hand, from leprosy, or from a form of paralysis in which there is great wasting of the muscles in the hand. Except in the first case, where the nerve may be put right by operation, this cannot be relieved.

Extra fingers are sometimes present. If small and deformed, they are better removed.

Webbed fingers can also be freed by operation.

Contractures are apt to form in the palm of the hand, bending one or more fingers immovably into the palm. (See Contracture.) This can be cured by operation, or sometimes by injection of a substance called fibrolysin, which softens the fibrous tissue causing the contracture, and this is then removed by massage.

Lower Extremity.—Congenital Dislocation of the Hip.—This is by no means rare, and may be present on one side, or more commonly, on both sides. It is due to imperfect formation of the acetabulum, the cup-shaped hollow in the haunch-bone into which the head of the thigh-bone fits. It is not usually observed until the child begins to walk; then it is noticed that the whole leg seems pulled up, and that the gait is of a curious waddling character, especially if only one side is affected, when also lateral curvature of the spine develops. The treatment is purely surgical, and is of a prolonged nature.

Knock-knee in young children is practically always due to rickets. The bone, being soft, yields from their weight when they stand or walk. The treatment is, firstly, the general treatment for rickets (*q.v.*). When detected early, absolute rest in bed is required, rubbing of the limbs, and such manipulation and pressure as will straighten out the limbs. No pain should be caused by the manipulation, but by perseverance a cure can often be brought about in a few months. In more advanced cases splints, or special boots with an iron stem running up the outside of the limb, are necessary; while, if the deformity be allowed to persist until adult life, when the bones are fully ossified, it can only be rectified by operation—taking out a wedge of bone and forcibly straightening. Knock-knee may also come on in young adults of relaxed constitution, who have in addition to carry heavy weights. This requires rest from such work, massage, and general tonics, such as Blaud's pills or Easton's syrup.

Bow-legs, or bandy-legs, also results from too early walking in rickety children. Manipulation should prevent their formation, but this condition is seldom so bad as to require operation.

Club-foot.—There are several varieties of club-foot, but it is unnecessary to distinguish between them here. Some are deformities present at birth, others arise in various ways in later life, the most common cause, perhaps, being acute infantile paralysis—an acute fever chiefly affecting children, and which results in paralyses of various extent, club-foot being a not uncommon one. The treatment of club-foot is always tedious, demanding care and patience on the part of all concerned. Each case requires to be treated on its own merits, depending on which particular nerve, muscle, bone, or joint is affected, but the general line of treatment is as follows. The first step is usually simple manipulation, and in congenital cases this should begin within a few days of birth, the mother or nurse being instructed to manipulate the foot into a good position, holding it there for some time daily. At the same time the muscles on the side of the leg opposite that to which the foot is drawn should be rubbed firmly. Later on, various splints and supporting apparatus may be required. When great contracture and deformity has taken place, operative straightening out may be necessary, and much can often be done nowadays to rectify matters by grafting healthy tendon, muscle, or nerve in the place of the affected ones.

Flat-foot is a condition frequently seen in young adults whose occupation exposes them to long standing or the carrying of heavy weights, any general deterioration in health assisting in the production of the deformity. It is due to a yielding of the ligaments in the sole of the foot and sinking down of the arch, so that the whole sole and inner edge of the foot come to rest upon the ground when the individual stands upright upon both feet. The condition is almost a natural one in certain negro races, and is more often seen in long than in short feet. It leads to considerable pain at times, a shuffling gait, and inability for active exercise on foot. The treatment required in the earliest stage, when the condition is threatening but is not actually developed, is rest or change of occupation to one where sitting is possible, tiptoe exercises for ten minutes night and morning, after which the feet and legs should be bathed in salt water and rubbed vigorously. In more advanced cases, where the deformity, though present, can be made to disappear on manipulation or by making the patient stand on tiptoe, some slight support is advisable, such as a cork instep-pad worn inside the sock. In addition, square-toed boots should always be worn, and the patient should walk with the toes turned slightly inwards. The exercises should be continued regularly. When the affection is so advanced that the deformity cannot be rectified by ordinary manipulation, there is nothing left but operation and forcible rectification.

Bunion and *hammer-toe* are described under Bunion.

Webbed toes do not require any treatment.

Delirium is a state of mental agitation characterised by restlessness, incoherence of speech, and delusions. Two main varieties are recognised:

1. Low or muttering delirium, in which the patient lies comparatively quiet, but is incessantly engaged in incoherent and disjointed conversations with imaginary personages or in communing with his own disordered brain. Surrounding persons and objects are not heeded. There may also be muscular twitchings and picking at the bed-clothes. This form of delirium is seen chiefly during the course of a febrile disease, especially in children, in whom any slight fever may cause wandering or delirium, particularly at night. No special treatment is, as a rule, required for this form of delirium, but, if it keeps the patient from sleeping and rest, sleeping-draughts may be necessary. Sponging with cold or tepid water, especially if the temperature be high (over 103° F.), will often quiet the delirium.

2. Active or wild delirium, in which the patient tries to escape from bed, shouts, struggles, and requires restraint. This form also appears in acute fevers, and a practical point to be borne in mind is that a quiet delirium may shift very suddenly into the active form. Delusions are common, and may cause the patient to be suicidal or homicidal, so that constant and careful watching is necessary. This form of delirium is, in an aggravated form, considered as one of the insanities—acute mania. (See Insanity.) A special form about which a little more must be said is *delirium tremens*, and the remarks under the treatment of that condition will apply to the treatment of other forms of wild delirium. Delirium tremens usually occurs as the result of a prolonged drunken debauch, but it may, though very rarely, come on after a single excess, or, in a moderate drinker, as the result of the

withdrawal of alcohol, of accident, or at the onset of an acute illness. The onset is sometimes sudden, but usually there is a period in which the person is sleepless, off his food, and very shaky. The shakiness or tremor affects specially the hands, face, and tongue. In the delirious state there are hallucinations, which commonly take the form of animals, so that the patient sees blue devils running about the room, rats and snakes crawling over the bed, &c. The delirium is very often an occupational one, so that the bar-tender is constantly serving out drinks to customers, the butcher cutting up chops, the barber shaving away at imaginary clients, &c., &c., all the while talking, shrieking, and struggling. At any time, frightened or annoyed by their hallucinations or delusions, they may make murderous assaults on their attendants or attempt their own lives. Physically their state is one of acute exhaustion, and very often there is a condition of low pneumonia.

The main object in treatment is to calm the patient's excitement and to procure sleep. An attendant, preferably a male one (for a man), constantly present, is an essential. A hot bath is an excellent sedative, and should be employed wherever possible. If not, a cold pack is almost equally efficacious, the patient being wrapped naked in a sheet wrung out of cold water, and then enveloped in several layers of blankets for a quarter of an hour or so. It is marvellous how soon this is followed by deep, sound sleep in most instances. It can be used even when pneumonia is present. Mechanical or forcible restraint should be avoided as much as possible, the patient rather being humoured. A nurse will often accomplish this more satisfactorily than a male attendant, but the latter should not be out of reach, in case of a wild attack. Violent excitement and struggling to get out of bed can be prevented by passing a folded sheet over the chest and fastening it securely under the bed, or, in the very worst cases, by tying the ankles and wrists to the bed. The patient should be fed with strong soups, beef-tea, and milk, but given no alcohol. Hypnotic drugs or sleeping-draughts are not infrequently required, but the ordering of these should be left for the doctor, who will be in attendance, and who will also direct what is to be done if such complications as pneumonia or threatened heart failure occur. In convalescence the patient is often given bitter tonics, and a change of scene to the sea or country in the companionship of some steady, reliable friend is very advisable.

Delusions.—See Insanity.

Dementia.—See Insanity.

Dengue.—An epidemic, infectious fever, occurring in tropical and sub-tropical countries, characterised by severe joint and muscular pains and typical rashes. The disease is also known as dandy fever, or, from the intensity of the pain, as breakbone fever. The countries where it is perhaps most likely to be met with are those bordering on the Black Sea, the Ægean Sea, and the Indian Ocean, the West Indies, and the northern parts of Australia. In many respects it is very similar to influenza, but the specific organism causing the disease has not yet been isolated. The disease occurs chiefly during hot weather, and spreads with great rapidity from person to person, and, like influenza, one attack affords no protection against subsequent attacks. The onset is sudden, the individual, apparently in perfect health, being seized with shivering, high fever, and intense pains in the bones, joints, and muscles, while a diffuse bright-red rash, similar to that of scarlet fever, appears all over the body. The knees are the joints usually most affected, being red and swollen. There is not the sore throat of scarlet fever, nor the profuse sweating which accompanies rheumatic fever, while in true influenza there is no such rash; so that dengue can, as a rule, be readily distinguished from these conditions. The further course of the attack is also typical. After from one to three days the fever subsides with sweating, although the pains do not go altogether. In one to three days more, however, there is a relapse, with fever and a rash, which, this time, is blotchy and dull red, more like that of measles. After a few days it fades, and the attack may be over; but, on the other hand, there may be a third or even a fourth relapse, and in any case the recovery from the weakness and joint pains is apt to be slow and tedious. Various complications, especially neuralgia and diarrhœa, may occur, but the disease is hardly ever fatal.

Treatment.—So long as the patient is feverish he should be kept in bed and on a low diet. Hot applications (fomentations, poultices, or bottles) to the joints give relief in the early stage, and phenacetin (10 grains thrice daily, in powder) should be given. Quinine is useless. The patient should also be sponged several times a day with tepid water. During convalescence the joints, if still painful, may be painted with iodine; baths and massage will also be found advantageous. Internally, iodide of potash (5 grains thrice daily after meals, in solution) has been found useful for getting rid of the ill-effects of the attack.

Derbyshire Neck.—A local name for goitre—swelling of the thyroid gland, in front of the neck—which is fairly common in the limestone regions of Derbyshire. (See Goitre.)

Devonshire Colic.—A local name for colic supposed to be due to cider. It is really due to chronic lead-poisoning, the lead getting into the cider either in the process of manufacture or in storage. See Lead-poisoning.)

Dhobi Itch.—This term is used rather loosely amongst persons in the tropics to indicate almost any itchy skin disease. Strictly speaking, it should be confined to an itchy form of skin disease occurring chiefly on the inner side of the thighs, occasionally in the armpits, and, in stout women, below the breasts. The disease occurs all over the tropics, and it may be met with also in sub-tropical regions and in the temperate zone. It is due to the growth of special varieties of mould or fungi, and is related to ringworm in this way. It owes its name to the popular belief that the disease is spread by linen contaminated while being washed by the native laundrymen (dhobi). Certain it is that the disease is readily communicable, and the infection may quite likely be spread in this manner. Regular epidemics of the disease often occur in schools, &c. The inner sides of the thighs present bright-red or fawn-coloured patches with a festooned margin, and are unbearably itchy. The scratching often leads to the development of a secondary moist eczema, and, if not treated properly, the disease may become a very chronic one, and may spread to other parts of the body.

Treatment.—Early cases usually do well if smeared twice daily with the following ointment :

℞ Resorcin	. . . . . .	1 drachm
Salicylic acid	. . . . .	10 grains
Vaseline	. . . . . .	½ ounce
Lanoline	. . . . . .	½ ounce

More severe cases generally require the use of ointments containing chrysarobin or Goa powder, which is the active constituent of most native dhobi-itch ointments. The ointment may contain from 2 to 5 per cent. of chrysarobin, a drug which, it must be remembered, stains the linen, and may render the skin very irritable while it is being used, and should certainly never be used in greater strength than that indicated, except under medical supervision.

Diabetes.—This is a condition in which the most striking feature is the habitual passing of large quantities of water, and thirst, leading to the constant drinking of large amounts of water. There are two forms of the disease :

1. A very rare form, known as *diabetes insipidus*, in which the urine contains no abnormal constituents, but may be enormous in quantity; the thirst is excessive, and the patient rapidly emaciates. The cause is unknown, although it has been observed that the condition has usually come on after prolonged physical exhaustion or great mental anxiety. This condition may be fatal in a few months, but, on the other hand, spontaneous arrest has been known to occur. No treatment can with certainty be said to have any effect, although improvement sometimes follows after electrical treatment. There is no use trying to limit the amount of water drunk by the sufferer.

2. *Diabetes mellitus*, in which the urine is not only increased in amount, but constantly contains more or less glucose or grape-sugar, is much commoner, and is what is meant when it is said merely that a person has diabetes. The mere presence of sugar in the urine is not sufficient to constitute diabetes, because small quantities may occur in the urine from time to time from various causes, and may even be permanent in stout persons, in those who are gouty, and especially after middle life; but, as a rule, in those cases there is no general deterioration of health, and the sugar can often be got rid of by strict dieting. In true diabetes there is definite deterioration of health, and the sugar is seldom entirely removable by dieting alone. Diabetes is a constitutional disorder in which something goes wrong with the chemistry of the starchy and sugary (carbohydrate) elements of the food within the body, but exactly what the something is, or whether it is the same in all cases, is not known for certain. The organs chiefly concerned with carbohydrate assimilation are the liver and the pancreas (sweetbread), and diabetes may conceivably arise from some disorder of either of these organs; but it can also be due to injuries of certain parts of the nervous system, particularly the floor of the fourth ventricle of the brain. In many instances, however, no definite cause can be found. There seems sometimes to be a hereditary predisposition, and men are certainly more often affected than women. Certain races, such as the Jews and the Bengalis, seem to be peculiarly liable to suffer from diabetes. The disease may come on at almost any age. When it occurs in young persons it assumes a very acute form, and is almost always rapidly fatal; in older subjects it runs a slower course, and may continue for years without getting worse, or even (but rarely) may be cured. The first symptoms to attract attention are usually thirst and the passage of increasingly large amounts of urine. The urine, instead of being about 2½ pints per diem, increases up to 10 pints, it may be, or even more; the urine is very pale in colour, and has a sweetish odour, not unlike that of new-mown hay. The presence of a very sweet odour (due to a substance called acetone) in the urine, and also in the breath, usually portends an early fatal termination. The presence of the sugar in the urine can only be told by chemical examination. Loss of flesh and weakness follow next, but the rapidity with which these come on depends on the individual case. The mouth is usually dry and the tongue red. There may be dyspepsia, or the digestion may be good and the appetite large (the form sometimes called "eating diabetes"). Constipation is always very marked. The skin becomes peculiarly dry; there is great liability to acne, boils, and carbuncles; and eczema, giving rise to much irritation and discomfort, is apt to come on about the private parts, from the irritation of the sugar in the urine, if great care is not taken to keep the parts scrupulously clean and dry. Neuralgia and neuritis are common in diabetes. As complications, consumption and pneumonia are fairly common, and many adult diabetic patients fall victims to one or other of these diseases. Diabetic coma is the most usual cause of death in young subjects; in this the patient suffers from marked air-hunger, a form of breathlessness which nothing relieves. The breath usually smells very sweet; there may be some abdominal pain at first, but the patient soon becomes drowsy, and finally comatose. Cataract may be mentioned as another not uncommon complication of diabetes.

Treatment.—Dietary measures form the most important part of the treatment of diabetes, but there is no uniform diabetic diet; each case must really be treated on its own merits, and the plan usually adopted by the physician is as follows. The amount of sugar in the urine with the patient on an ordinary diet is first ascertained. Then the patient is put for a few days on a diet almost free from carbohydrates, and the amount of sugar again ascertained. Usually it will be very much less. Then saccharine and starchy foods are allowed in gradually increasing quantities up to that point at which the amount of sugar in the urine begins to increase again in amount. The amount of carbohydrate food allowed should be just less than this. All this necessarily involves frequent examination of the urine to know the amount of sugar being excreted in it. Another important point in dieting is that the patient should not, if possible, lose weight on whatever diet he is put. The foods of which the patient may, as a rule, eat freely are as follows: all animal foods, except liver, sausages, and oysters; all clear soups; unsweetened jellies; green vegetables (including asparagus, celery, tomatoes, cucumbers, mushrooms, radishes, and most kinds of unsweetened pickles), but not peas, beans, and lentils; all nuts, except chestnuts; oranges, lemons, and most fruits are only permissible in strict moderation. Amongst beverages, tea, coffee, cocoa, lemonade, and aerated waters may all be taken freely if unsweetened; spirits and most natural wines are allowable, but not malt liquors, sweet wines, or liqueurs. Some form of alcoholic beverage should form part of the regular dietary of diabetics, as alcohol aids in the digestion of fats, and is to some extent itself a food replacing the sugars.

To be avoided, or only taken in specified quantities: liver, thick soups, ordinary bread, and all articles made from rice, maize, or wheat-flour; potatoes, turnips, artichokes, and all starchy vegetables; syrups, and sugar in any form.

A limited quantity of ordinary toasted bread or of potato is the form in which carbohydrate food is usually allowed. No very satisfactory substitute for bread exists. There are many diabetic breads, &c., on the market; many are by no means what they pretend to be—viz. starch-free. The best are those prepared from nuts or from casein. The starch in oatmeal appears to be a less harmful variety than most others, and some forms of cure for diabetes allow large quantities of oatmeal in the dietary—in fact, the patient almost lives on oatmeal in one form or another. Milk can only be taken in great moderation because of the presence of the sugar of milk in it, but cream may be taken more freely. Fats are of great use in diabetes, butter, cream, cream cheese, bacon, and salad oil being the best forms. It must never be attempted to cut out the starches and sugars entirely from the dietary, in the hope that thereby the sugar will disappear entirely from the urine; such a proceeding is fraught with the greatest danger of bringing on diabetic coma. The patient should be allowed to satisfy his thirst; there is nothing to be gained by trying to limit the intake of fluid. In young diabetics it is seldom of any use trying even to limit the amount of carbohydrate food; in them, and in any person where the disease is far advanced, such endeavours only hasten the emaciation and onset of coma. It is far better to let them eat what they like and die in comfort.

Hygienic Measures.—Moderate exercise is advisable, but never enough to cause fatigue; a daily cold bath if the case is not far advanced, warm clothing, and, if possible, wintering in a mild climate.

Drug Treatment.—This is not satisfactory. Opium in some form or other is the drug which gives the best results, and it will practically always be ordered by the physician. Constipation, which is always present, and which is aggravated by the opium, is best treated by the regular use of saline aperients such as Epsom salts (one-half to one tablespoonful in a tumblerful of water on rising), sulphate of soda (similar doses), or one of the aperient mineral waters, such as Carlsbad or Hunyadi Janos. Alkalies are also of considerable value, and part of the patient's drinks should consist of aerated alkaline mineral waters, or effervescent citrate or bicarbonate of soda may be taken in teaspoonful doses in water several times a day. When coma is threatening, alkalies are at least of more value than anything else, and they are then administered by intravenous injection sometimes. The itchiness and eczema can be largely prevented by cleanliness, and, after passing water, the parts should be wiped by a sponge soaked in boracic lotion.

Diarrhœa.—Diarrhœa, the excessive discharge from the bowels of too fluid stools, is not in itself a disease, but a symptom which may be due to many different causes, some comparatively trifling, others serious in nature. If excessive, and if not easily checked by treatment, it must be regarded as a serious condition, especially in children, who early succumb to it. It will render description easier, and probably facilitate reference, if the subject be considered under acute and chronic diarrhœa, and also as it occurs in adults and in children.

1. *Acute Diarrhœa.*—(*a*) *In Adults.* Acute diarrhœa in adults may be one of the initial, and perhaps one of the most important, symptoms of a serious fever. Thus, in typhoid or enteric fever there is usually mild diarrhœa, three or four movements a day; the patient has headache and general seediness for perhaps a week before the disease can be definitely recognised. (See Typhoid Fever.) In cholera the incessant diarrhœa, with vomiting and cramps and rapid collapse, can hardly be mistaken. (See Cholera.) In dysentery the stools are at first fluid; they soon become bloody, composed largely of slimy mucus, very frequent, and accompanied by constant straining and desire to pass more. (See Dysentery.) Some forms of influenza are also accompanied by vomiting and diarrhœa. (See Influenza.) The commonest cause of diarrhœa, however, is some form of enteritis, or inflammation of the interior of the bowel. This inflammation may be catarrhal or ulcerative. The causes are various. A chill may be one, some persons "catching cold" most readily in the bowels; hot weather another; too much food or indigestible food; ptomaines from the decomposition of food; numerous irritant poisons, both mineral and vegetable, whose action, causing vomiting, purging, and pain in the abdomen, closely resemble the onset of a severe catarrhal enteritis. Very severe forms, usually accompanied with vomiting, may closely resemble Asiatic cholera; these are sometimes known as cholera nostras, British cholera, &c. Lastly, an acute diarrhœa, but without pain or nausea, may be purely nervous in origin—*e.g.* in students before examination.

Treatment.—This will refer merely to the treatment of simple diarrhœa due to catarrh or some irritant substance in the bowel, not to the treatment of severe diseases in which the diarrhœa is but an incident, although it may be a severe and disagreeable one. It is generally wise, in the first instance, to give a purgative, so as to get rid of any irritant substance which may still be in the bowel. This may consist of calomel (3 or 4 grains of "blue pill"), or, best of all, castor oil (one to two tablespoonfuls). Along with it, or shortly afterwards, 20 drops of laudanum may be taken. Should the diarrhœa not be checked within a day after the administration of this dose, some astringent will be necessary. This may consist of chalk mixture (two tablespoonfuls) or carbonate of bismuth (20 to 40 grains, thrice daily, in powder). Where there is pain, or even without it, a little opium is often necessary. Five or ten drops of laudanum may be added to the above preparations; or, very good preparations are aromatic chalk powder with opium (30 grains thrice daily), or compound kino powder (10 to 20 grains thrice daily). The patient should be in bed, and with either an ice-bag or a poultice on the abdomen. The best diet is starvation, with only little pieces of ice to suck; but, if the diarrhœa lasts any time and food must be given, or if the patient insists on food for fear his strength should run down, it should consist of small quantities of milk with aerated water or lime-water added, white of egg and water, concentrated beef-tea, chicken jelly, or raw meat-juice in water. Everything should be cold, or even iced.

Nervous diarrhœa may be prevented by 10 or 15 drops of laudanum, but the sufferer should consult a doctor with regard to his general nervous state.

(*b*) *In Children.*—Diarrhœa in children may be due to the same causes as in adults, but very slight indiscretions in diet suffice to set up diarrhœa in children, while infants and young children are particularly liable to suffer from catarrhal enteritis. This condition, or different forms of it, which go under the names of cholera infantum, infantile diarrhœa, epidemic gastro-enteritis, summer diarrhœa, &c., is a serious disease, and is responsible for many deaths yearly. The disease often assumes epidemic form during the summer months, and, although directly due to certain germs getting into the bowel, bad or unsuitable food is usually responsible for their getting there. Dirty feeding-bottles and milk are the greatest source of danger, for milk, under the conditions in which it is usually supplied and stored contains numerous germs, which multiply rapidly in warm weather, so that the milk simply teems with them. Souring of the milk is the obvious result of their presence, but they may be present in numbers amply sufficient to cause bad diarrhœa long before the milk turns sour. The practice of giving young children "a bit of what is going," no matter how unsuitable it may be, is another fertile source of catarrhal enteritis. The stools become green in colour, and very foul-smelling; in severe cases there may be blood-stained mucus also. The abdomen becomes somewhat distended; there is not much pain except in very bad cases, when there will also probably be vomiting. The child rapidly becomes flabby, pinched, and pasty, and emaciated if not promptly relieved.

A raised temperature and loss of the elasticity of the skin, especially over the abdomen, are very characteristic of this form of diarrhœa. Constant desire to go to stool, with great straining and blood in the stools, should lead to the suspicion of intussusception, a very serious condition. (See Intestines, Diseases of the). Appendicitis in children sometimes commences with diarrhœa rather than with constipation. (See Appendicitis.) In severe cases convulsions will probably occur.

Treatment.—For preventive measures—and summer diarrhœa should be largely prevented by care —see the section dealing with Infant Feeding. Simple diarrhœa in infants and children can usually be quickly cured by a dose of castor oil, followed next day by a teaspoonful of chalk mixture, with or without a pinch of compound catechu powder in it, three times a day; or one or two teaspoonful doses of Gregory's powder may of itself be sufficient. Opium preparations should not be given to children except on medical advice, since children are very susceptible to its action. A child with diarrhœa should not be bathed, only sponging of the hands and face, and of the buttocks after a motion, being allowed. The feet must be kept warm, and the abdomen should be kept covered with a flannel binder. For food, an infant should be put on two parts of boiled milk mixed with one part of lime-water, or, if there are curds in the stools, on albumen water, which is made by whipping up the white of an egg in a small tumblerful of water. Older children should be forbidden puddings and fruit, and kept on milk and rusks, dry toast, broth, and boiled fish. The bath should also be stopped temporarily.

In severe or summer diarrhœa children are probably best treated with grey powder (half-grain doses every four hours), which is an excellent intestinal antiseptic. They should be wrapped up to the armpits in a towel wrung out of cold water, and then closely tucked in with dry blankets. Every few hours take the child out of the wraps, rub dry, and again swathe. This cold packing can be kept up for hours, or even days, and should be done so long as the temperature is high and the skin inelastic. If vomiting be severe, nothing should be given but cold boiled water, which should be allowed freely. When this is retained, try cautiously—say a teaspoonful every quarter of an hour—some wine whey or albumen water, with a few drops of whisky in it. Milk in any form is forbidden.

In summer diarrhœa, and in any form of diarrhœa which does not quickly stop under the measures advised, or is very severe, it is always advisable to send for medical assistance, because the condition can be very dangerous, and various other measures which are beyond the scope of home treatment may have to be adopted.

2. *Chronic long-continued or frequently-recurring Diarrhœa.*—(*a*) *In Adults.* Here again there are a number of causes. Some forms occur in exhausted, run-down, or neurasthenic persons. One form of this is the so-called "morning diarrhœa," in which there are two or three movements of the bowels at short intervals in the early morning, with freedom for the rest of the day; another form goes by the name of "mucous colitis" (in this the paroxysms of diarrhœa, preceded and accompanied by pain in the lower part of the abdomen, usually on the left side, terminate in the discharge of tough pieces of mucus, in the shape of strings or casts of the bowel); another, lienteric diarrhœa, in which the bowels move whenever the person eats. In a number of chronic diseases diarrhœa is a symptom. In some, such as heart disease, Bright's disease, or cirrhosis of the liver, in all of which there may be dropsy, the diarrhœa may actually be playing a useful part in helping to get rid of the fluid, and should not be checked unnecessarily. In others it is a symptom of, and leads to, greater exhaustion. Some diseases of the bowel lead to chronic diarrhœa—*e.g.* simple ulcera-

tion or tubercular ulceration of the intestine (consumption of the bowel), which may be secondary to consumption of the lungs, or independent. Cancer low down in the bowel may lead to constant straining, with frequent passage of small quantities of mucus; in this instance the fæces will probably be flattened or ribbon-like from having to pass through a narrowed part where the growth is. Diarrhœa is sometimes really an index of constipation, the presence of hard masses of fæces setting up a catarrh and flow of mucus. Occasionally recurrent diarrhœa is a symptom of hysteria. Lastly, there are some tropical conditions, of which the chief are hill diarrhœa, or sprue, and dysentery, which may take a chronic form. (See DYSENTERY and SPRUE.)

Treatment.—This naturally varies considerably with the cause, and probably in most cases medical advice will be necessary. The neurasthenic diarrhœas require, in many instances, regular "rest cures" in addition to local treatment for the bowel, which in the case of mucous colitis especially is often very troublesome, involving much washing out, &c. (See NEURASTHENIA.) Lienteric diarrhœa is usually easily cured by small doses of arsenic. Ulceration of the bowel often requires the strongest remedies, such as lead and opium pills, and even these may not serve to check it; in any case, they have no influence in curing the underlying cause. The subjects of chronic diarrhœa should keep the abdomen thoroughly warm by the use of a broad flannel bandage or binder, or cholera belt, as it is sometimes called. A good, useful drug, and the safest for general use, is bismuth, which may be used in large doses, say half a teaspoonful of the carbonate or of the subnitrate of bismuth two or three times a day.

(*b*) *In Children.*—The chief cause of chronic diarrhœa in children is a frequently-recurring catarrh. To stop this the child must be carefully guarded against chill, and the feet and legs in particular kept thoroughly warm. Milk should be omitted from the dietary, and only very little starchy foods (bread, farinaceous puddings, &c.) taken. Chalk mixture may be tried, but it often fails to check the diarrhœa, the most satisfactory drug in this instance being nitrate of silver, the use of which, however, requires a doctor's supervision.

The same remarks apply to tubercular disease of the bowel, which is not uncommon in children, but here a cure of the condition cannot be expected; at the best one can only hope for alleviation.

Lienteric diarrhœa also occurs in children, the bowels moving whenever food is taken. For this get a prescription from the doctor containing small doses of arsenic and nux vomica, and a quick cure should result.

Diphtheria.—This is, in the great majority of instances, an infectious form of sore throat, characterised by the presence of patches of membrane on the throat. The disease is due to a specific organism—the bacillus diphtheriæ. The disease is spread in various ways. One is by close personal contact, such as kissing, or using a drinking-cup which has been used by an infected person, or being too close to a person with diphtheria coughing, and inhalation of pieces of membrane with the bacilli, or, as used to happen sometimes to doctors, getting the membrane into their own throats when trying to suck it out of the throat of a patient. Infected milk is another common mode of infection. Domestic animals appear to suffer from diphtheria, and infection has certainly been known to be caught from cats. Bad drains are often blamed for causing diphtheria, but only with a certain amount of truth. Diphtheria bacilli do not live in the contents or air of drains, but the effects of the emanations from drains on the throat is such as to cause a low type of sore throat which is very liable to become the seat of a diphtheria, should the infection be picked up anywhere, whereas, if the throat were healthy, it might be thrown off. The disease often assumes epidemic form, especially in the later part of the year, but isolated cases crop up at all times. The difficulty in explaining the cause of their occurrence is to be accounted for, at least in some, if not in all, instances, by the fact that the bacillus can, not infrequently, be found in the throats of healthy persons. Let such a person get below par, however, and the bacilli may then assume malignant characters, and set up the typical disease. Such diphtheria-carriers, as they are called, are not only a danger to themselves, but also—innocently, it is true—to their neighbours, and, unfortunately, they cannot be recognised except by a bacteriological examination of the throat. Children are most subject to diphtheria, but adults are by no means exempt. One attack does not protect against subsequent attacks. "Mixed infections" are not uncommon, so that diphtheria is not infrequently associated in the same patient with scarlet fever, measles, or whooping-cough. Attacks vary considerably in their severity, from a slight sore throat, whose character can only be told by bacteriological examination, to the severest forms of gangrenous inflammation, but the features of an average case are something as follows:

About four days after infection the patient begins to feel out of sorts and feverish, with a sore throat and difficulty in swallowing. The temperature rises rapidly, reaching about 103° F. by the end of twenty-four hours, by which time the typical membranous patches will probably have formed. These patches of membrane are to be seen usually about the tonsils, uvula, and soft palate, showing up distinctly as greyish-white patches on the general red inflamed throat. If a piece be scraped off, it leaves a raw, bleeding surface. Chewing and swallowing become exceedingly painful. In a favourable case the membrane ceases to spread, and separates about the fourth day; in a more severe one it may take considerably longer. One of the worst types of diphtheria is where the membrane spreads down into the larynx and windpipe; this form is sometimes called "membranous croup." If this occurs, the patient becomes very breathless, the breathing being very harsh and noisy. The distress may increase until the patient is ultimately asphyxiated, or relief may be obtained by the coughing up of the membrane. In some cases the infection starts, not in the throat, but in the nose, giving the voice a nasal or snuffling character, or the membrane may spread from the throat into the nose; sometimes it spreads down the gullet. It may be mentioned at this point that infection by the diphtheria bacillus (true diphtheria) occasionally occurs at sites quite away from the throat, such as the eye, or on wounds. In all forms of diphtheria there is considerable absorption of poisonous toxins from the seat of infection, and these toxins have a particularly weakening action on the heart, heart failure being one of the great risks constantly present in diphtheria. Another result of the toxins is to set up an inflammation of the kidneys; this is, however, usually quite a temporary condition. Another complication due to them, seen in about 20 per cent. of cases, and coming on during convalescence, is paralysis. The part most often affected is the palate, paralysis of which causes a nasal type of voice, and regurgitation of fluid through the nose when the patient drinks. Sometimes other muscles are affected, such as eye muscles or muscles of the limbs, but in all cases the paralysis is only temporary, and disappears, as a rule, in a few weeks. The diagnosis of diphtheria is now usually confirmed by taking a swab from the throat and submitting this to bacteriological examination. This is *advisable* from the point of view of treatment, because the sooner it is diagnosed, the more satisfactory the results of treatment. It is *necessary* because, on the one hand, the disease may be so mild that a typical membrane does not form, and yet the patient is just as dangerous to others as a severe case; on the other hand, membranous inflammations of the throat may be due to other things than diphtheria. A membrane forms in thrush (see MOUTH, DISEASES OF THE), but this is whiter and more easily scraped off; in simple tonsilitis or quinsy patches are seen on the tonsils, but they are more yellowish or creamy than in diphtheria, and do not leave any bleeding area when removed; some other organisms also give rise to sore throats very like diphtheria in appearance, and they can only be definitely distinguished by the absence of the bacillus diphtheriæ. These cases are often spoken of as "diphtheritic sore throat," this meaning simply that there is a membrane, but that it is not true diphtheria.

Treatment.—Two main points in the treatment of diphtheria are: (1) early use of antitoxin, and (2) rest. Prior to about 1896 the mortality from diphtheria used to be about 30 per cent. of all cases, now it is reduced to about half that figure with the general use of antitoxin treatment. Antitoxin causes the membrane to disappear and the disease to run a much milder course. Its use is free from risk, the only ill effects being occasional rashes, and temporary feverishness and joint pains. It has been employed sometimes as a preventive in persons who may have been exposed to infection, but this is not now recommended, as there is some risk should that person later on actually catch diphtheria and require antitoxin treatment. The antitoxin is injected subcutaneously or intramuscularly by means of a syringe and hollow needle. Rest is of extreme importance because of the ever-present risk of sudden heart failure. The patient must on no account be allowed even to sit up in bed for several weeks after the acute stage of the illness is past, and for some months he will have to be very cautious in the amount of exercise taken. The patient's strength must be kept up with milk and strong soups, if he can swallow, and by nutrient enemata if he cannot. Alcohol, strychnine, and iron are often employed, but as it is obvious that a doctor should be in attendance, the ordering of these can be left to him. The local treatment of the throat consists in the inhalation of steam, which renders the membrane more easily coughed off, and the use of some form of antiseptic spray or gargle, a spray being used for young children, and the gargle for older patients. The gargling, spraying, or painting should be done every two hours, and the lotion used may be boracic lotion, or a lotion made from the nasal douche tablets which are mentioned under COLD IN THE HEAD, but with the addition of a pinch of chlorate of potash to each lot of lotion as it is made up. If there be great objection to the spraying, as is often the case with children, it should not be persevered with, as the risk of struggling, with the heart in the condition in which it is, is greater than the benefit to be obtained by the local treatment of the throat. When there is any spread of the membrane into the larynx, the sooner tracheotomy is performed the better.

It is hardly necessary to add that cases of diphtheria should be isolated, and that all articles used by the patient should be disinfected at once. Those in attendance on diphtheria patients should use frequent gargles for the throat of the type of that mentioned above for gargling in diphtheria, as a preventive measure. The period of quarantine for those who have been in contact with a person who proves to have diphtheria should be one week, and they should be looked upon as suspects, capable of getting or of distributing the disease, until two consecutive examinations of the throat prove negative as far as the finding of diphtheria bacilli is concerned. Similarly, a person who has had diphtheria should be kept in isolation until the bacteriological examination of the throat is negative.

Diplopia.—See DOUBLE VISION.

Dipsomania.—See the section dealing with DRUG HABITS: ALCOHOL.

Disseminated Sclerosis.—A chronic disease of the nervous system, in which the patient becomes very emotional; and, as the early physical signs and symptoms—paralysis, numbness, tremor, interference with the act of passing water, &c.—are apt to come and go in a very puzzling manner, the patient is very apt at first to be thought merely hysterical. (See NERVOUS DISEASES.)

Diver's Palsy.—See CAISSON DISEASE.

Dizziness.—See VERTIGO.

Dreaming.—See SLEEP, DISORDERS OF.

Double Consciousness.—A rare condition, in which the individual has practically two separate and distinct personalities (like Dr. Jekyll and Mr. Hyde), sometimes the one, sometimes the other, being dominant. The condition is usually associated with epilepsy, and will be further referred to under that heading.

Double Vision.—When objects are seen double it means that the two eyeballs are not acting in unison, so that the rays of light coming from any object fall on non-corresponding parts of the two retinæ, and the images formed, instead of blending into one, are perceived separately, and everything looks double. It usually indicates a paralysis of one or more nerves going to the muscles which move the eyeball, and this may occur in several nervous diseases and affections of the brain. Squint is usually present also. Temporary attacks of double vision may follow injuries to the eye, intoxication, or diphtheria. (See under NERVOUS DISEASES, and EYE, AFFECTIONS OF THE.)

Dropsy.—This is the general term applied to an accumulation of watery fluid beneath the skin, or in one or more of the cavities of the body. The term *œdema* is applied to a dropsical accumulation beneath the skin of a part of the body—*e.g.* the leg, or in an organ, such as the lung; *anasarca* means œdema over the whole body. Special names are also applied to dropsies involving the cavities, the chief one being *ascites*, meaning dropsy in the abdomen. The presence of œdema is usually easily detected. There is painless swelling, the skin is pale, smooth, and shiny, and, if pressure is made with the point of the finger, especially over a bony surface, such as the shin, a pit forms, and some appreciable time elapses before the depressed skin regains its former level. Dropsy is not a disease in itself, but merely a symptom of disease in some part, although it may be a very serious and distressing symptom, and demand special treatment. The two chief causes of dropsy are heart disease and Bright's disease. Cardiac dropsy, due to enfeebled circulation from heart weakness or actual valvular disease of the heart, begins in the feet, and gradually extends upwards as the condition gets worse. It is most marked in the lower extremities after standing or walking during the day, and diminishes, or in slight cases disappears, after a night's rest. The dropsy of Bright's disease is in marked instances extreme, affecting the whole body to a greater extent than in any other affection. It begins first in the face, under the eyes, and gradually spreads downwards; it is worst in the morning, and lessens during the day if the patient sits or stands. It is worst in the acute forms of Bright's disease, but also occurs in the chronic form.

Slight œdema of the feet and ankles is often seen at the end of the day in anæmia of any variety. Beri-beri and multiple neuritis are diseases in which there may be general dropsy. Œdema of one arm may occur from pressure on the veins in the armpit by enlarged glands, such as are apt to occur secondarily to cancer of the breast. Œdema of one leg is usually due to inflammation of the femoral vein in the leg (phlebitis), such as may occur after pregnancy (white-leg), after typhoid fever, &c., or it may be due to a tumour in the abdomen or pelvis pressing on the vein of one side. Œdema of both legs may be due to heart weakness (early stage), to obstruction in the liver (along with ascites), or to obstruction in the lymphatics of the limb as occurs in the condition called elephantiasis. Dropsy commencing in the abdomen (ascites) is almost always due either to obstruction to the flow of blood through the liver, or to chronic (tubercular) peritonitis. If large in amount, it may be followed by dropsy of the lower limbs. In cardiac and renal dropsy, on the other hand, ascites may follow dropsy of the lower limbs.

Treatment.—The same treatment obviously will not apply to all cases. For the slighter degrees of dropsy the general treatment for the causal disease will usually suffice, no special measures being necessary. In cardiac dropsy complete rest in bed is essential, and heart tonics, particularly those which at the same time increase the flow of urine, such as digitalis, are usually administered; but these are not drugs to be taken unless specially ordered by the doctor. The amount of fluid can also be diminished by promoting a free movement of the bowels by the use of such a drug as compound jalap powder (30 grains, or half a teaspoonful, every night), by a dry diet, and a salt-free diet, such as is referred to below. If the dropsy does not yield to drugs, and particularly when it is accumulating in the chest and causing great embarrassment to the heart's action with great shortness of breath, then some of the fluid must be drawn off by tapping. The treatment of the dropsy of acute Bright's disease is simply the routine treatment for that disease, which will be found referred to under that heading. In chronic Bright's disease it is permissible and advisable, which it is not in the acute form, to use drugs which stimulate the action of the kidneys, and of these one of the best is caffeine, provided that it is used in small doses only and intermittently—say 1 or 2 grains three times a day for a day or two, and then stopped for a day or so. Excellent results often follow the use of a salt-free diet—*i.e.* no salt is to be taken with the food, and none used in cooking, even the bread being made without salt. Meat is generally not allowed in the dietary of a patient with Bright's disease and dropsy, nevertheless it is often advisable in chronic cases to avoid giving large quantities of milk and other liquid foods, and such patients may do better on a diet of solid food like meat and bread. Drawing off of fluid may be necessary just as in cardiac dropsy, and in both instances it may require to be done repeatedly. For ascites, repeated tapping of the abdomen is usually necessary; sometimes, when the condition is due to cirrhosis of the liver, an operation is done with the object of allowing the blood, or, at all events, some of it, to get round another way than via the liver, and thus lessen the dropsy. Considerable success may attend this procedure.

Drop-wrist.—A condition in which, owing to paralysis of the muscles on the back of the fore-arm, the wrist droops and cannot be straightened out, and much less bent backwards. It may be due to a neuritis of the nerve which supplies these muscles, and is not uncommon in the neuritises of chronic lead-poisoning and of chronic alcoholism. (See LEAD-POISONING and NEURITIS.) More temporary forms of drop-wrist may result from pressure on the same nerve in the upper arm by the head of a crutch in the armpit (crutch-palsy), or by a person going to sleep with his arm hanging over the back of a chair, or with the head resting on the upper arm. These forms only require a little massage to the muscles on the back of the forearm to prevent wasting, for recovery is only a matter of a little time. Drop-wrist may also result from the nerve being divided by a cut, &c., in which case suture of the divided nerve is usually followed by complete recovery.

A similar condition may affect the muscles in front of the leg, producing a drooping of the foot, or drop-ankle. This is usually the result of a neuritis.

Dumbness.—Dumb children may be divided into those who are dumb because they are deaf, and those in whom the hearing is good. Deafness is readily discovered by finding that the child pays no attention to noises made behind its back. If deaf, having no knowledge of sound, it cannot understand or make intelligible sounds. Such deafness is sometimes acquired, but in most cases is congenital and incurable. Such children can be taught lip-reading, however, and become quite useful members of society. (See DEAF-MUTES.) When hearing is good, on the other hand, the dumbness is usually due to mental deficiency, and very little can be expected in the way of teaching such children.

Duodenum, Affections of the.—The duodenum is the first part of the intestine, into which the food passes when it leaves the stomach. It may be affected by various diseases which affect the intestines (see INTESTINES, DISEASES OF THE), but the conditions which affect it specially are :

1. *Catarrh.*—This is often associated with acute gastric catarrh (see STOMACH, DISEASES OF THE), and may be accompanied with enteritis or catarrh of the whole intestine, in which case there will be diarrhœa; but the special feature of duodenal catarrh is jaundice, from blocking up of the mouth of the common bile duct. For treatment see under JAUNDICE.

2. *Ulcer.*—Duodenal ulcer is very similar to gastric ulcer, one of the main distinguishing features being that the pain complained of comes on some hours after the taking of food—*i.e.* when the food enters the duodenum—instead of almost immediately after eating. For further consideration see under GASTRIC ULCER (STOMACH, DISEASES OF).

Dust Diseases.—There are a number of conditions affecting workers in certain trades in which dust particles of an injurious nature are liable to be inhaled into the lungs. Some of the special trades are miners, stone-masons, knife-grinders, &c. The conditions will be further discussed under LUNGS, DISEASES OF THE.

Dysentery.—The term dysentery is applied to a severe form of diarrhœa in which there is great straining, and the stools are very slimy, and at some time or other blood-stained. The disease is constantly present in many tropical countries, especially in damp, low-lying places; it often assumes epidemic form, especially where many people are crowded together in insanitary surroundings, and it is one of the great scourges of armies in the field. Isolated cases may, however, occur almost anywhere, in both tropical and temperate climates. Dysentery may be due to several causes, although the symptoms of all are much alike. One form is due to a lowly, minute form of animal parasite in the bowel—an amœba—and it is this form which is liable to be followed by tropical abscess of the liver. Others are just as definitely due to a specific bacillus, while others seem to be due to the eating of over-ripe fruit or bad food, without any special organism being present. The infection is spread, in most cases, by water, just as in cholera, and the same precautions should be observed with regard to drinking-water and disposal of the stools from dysentery patients as in the case of cholera. One attack of the disease, far from giving immunity, renders the individual more liable to subsequent attacks. Intense inflammation of the large intestine, especially of the lower end of it, and often with ulceration, is the condition found in the bowels in dysentery.

Dysentery commences with a general feeling of unwellness, feverishness, discomfort in the abdomen, and diarrhœa. The diarrhœa increases, with colicky pains, a great feeling of weight in the lower part of the abdomen, and constant straining and desire to go to stool. In bad cases the bowels may move one hundred times a day or more. The evacuations, at first large and watery, become scanty, mucous, or slimy, and contain pus (matter) and more or less blood; the smell is characteristic and peculiarly offensive. There is tenderness and distension of the abdomen, varying in degree with the severity of the individual case. The fever also varies in amount, but there is always considerable thirst, scanty flow of urine, nervous depression, and great general prostration. In very severe cases the bowel becomes gangrenous, and death may result in a few hours; in mild cases, recovery, with cessation of pain, less frequent evacuations, and improvement of spirits, may set in in a few days; but more often the symptoms last some weeks, and convalescence, from the great debility, is slow. Sometimes recovery is imperfect, the disease dragging on in a chronic although less severe form, or it may even be sub-acute or chronic from the outset.

It is important that the rectum be examined, because, in countries where dysentery is prevalent, other diseases of the rectum—such as piles, cancer, fistula, bilharzia disease, &c.—are apt to be simply labelled chronic dysentery without examination, and treated as such, with, of course, disappointing, and perhaps serious, results.

Treatment.—For acute dysentery the patient must be kept in bed, warm, and on low diet; milk, beef-tea, and arrowroot, in quantities of not more than a small teacupful at a time, being the only articles allowed. If the abdominal pain is severe, large hot fomentations or poultices should be applied over the abdomen. The medicinal treatment cannot be said to be quite satisfactory; one of several plans may be adopted. In India the favourite is probably the ipecacuanha method. In this a large dose of powdered ipecacuanha root (30 grains, or even more) is given, preceded half an hour before by 20 drops of laudanum to lessen the tendency to vomit. A mustard-leaf just below the lower end of the breast-bone will also tend to check vomiting. If vomiting does occur, the medicine must simply be given again. The dose is repeated, with the same precautions, once daily, cutting down the amount by a few grains each day if the case is doing well. Return to an ordinary diet must be very gradual, but vegetable food, even green vegetables, can usually be taken quite safely when meat would cause a relapse. The great disadvantage of this method is the nausea and vomiting which are so apt to occur. In tropical America the plan usually followed is this: Complete rest in bed, a rather more generous milk diet, and the administration of enormous doses of bismuth, a heaped-up teaspoonful of the subnitrate of bismuth being given, suspended in water, every three hours, day and night, in severe cases, lessening the amount only as improvement sets in. Along with this the lower bowel is washed out, or rather irrigated, by means of a long, soft rubber tube pushed well up, using plain boiled water or saline solution. This method appears to give very good results, but the same care is necessary in returning to solid food.

For chronic or relapsing dysentery the sufferer should, if at all possible, go for a considerable time to a temperate climate. Bismuth, in less heroic doses than those mentioned above, often does well in such cases, but it is often necessary to use some form of astringent irrigation of the lower part of the bowel. Nitrate of silver is a drug frequently employed for this purpose. Its use is painful, and the patient has to be prepared beforehand with opium or morphia. Native remedies are by no means to be despised in chronic dysentery, especially decoctions of Bael fruit or of mangosteen skins, but to be efficacious they must be made from the fresh fruit.

Dyspepsia.—By dyspepsia or indigestion is meant pain or discomfort of any kind associated with the digestion of food. We do not propose to deal here with acute dyspepsia or acute gastric catarrh, nor yet with the indigestion which always accompanies definite disease of the stomach, such as ulcer and cancer, but only with those forms of indigestion, due to faults of secretion and motility of the stomach, which are met with every day, in persons who are for the most part otherwise healthy. These other conditions will be discussed under Stomach Diseases, but it may be well at this point to refer briefly to those more serious conditions which have indigestion for one of their symptoms, so that persons suffering from dyspepsia may at least be alive to the fact that it may be but a symptom of some more serious condition. Gastric ulcer is met with almost solely in young persons, especially anæmic girls; vomiting of blood is a frequent symptom, and of great diagnostic importance. Cancer of the stomach is exceedingly difficult to recognise in the early stages, when it is most amenable to treatment. The symptoms are, at first, simply those of indigestion, but the possibility of it should always be borne in mind when indigestion comes on in a person of forty or over, from no very obvious reason, especially if such a person has not been subject to stomach troubles previously, or if there is a history pointing to the previous existence of a gastric ulcer. Dilatation of the stomach, which may be due to long-standing dyspepsia, is characterised by the vomiting, at intervals of a day or two, of a large quantity of fermenting food which accumulates in the stomach. A moveable kidney, from the drag it makes on the outlet of the stomach, is another not uncommon cause of dyspepsia, especially in women.

The following list of some of the chief conditions causing dyspepsia should be studied, because, although indigestion may be temporarily relieved or even cured, it can but seldom be permanently got rid of if any of these causes persist. Many of them can be removed if the individual will take the trouble to do so; sometimes, unfortunately, the constitution or the circumstances of the individual are too strong for him.

"Eating too much or too often; insufficient chewing of the food, whether from bad teeth or bolting the food in a hurry; too little outdoor exercise, or exercise too soon after meals; too much tea, alcohol, or condiments; tight lacing; excessive worry or mental emotion; bad teeth."

Many varieties of dyspepsia or indigestion have been described, but for all practical purposes the forms of indigestion to which we have limited this article, as described above, fall into two groups—viz. those in which too much acid is secreted by the stomach (acid dyspepsia), and those in which too little is secreted (atonic dyspepsia). In all cases the immediate cause of the symptoms is the same—viz. that the food remains in the stomach long after it should have passed on, and acts as an irritant, giving rise directly to pain and flatulence, and indirectly to languor, sleeplessness, and disturbances of temper, which are symptoms common to both forms of dyspepsia. The irritation of the tarrying food sets up an excessive flow of slimy mucus in the stomach. Alkalies given *before* meals get rid of this mucus and of the undigested remains of the previous meal, leaving the stomach cleansed and ready for the next. Hence the value of bicarbonate of soda—say 10 grains, or as much as will lie on a threepenny bit—taken about twenty minutes before meals, dissolved in, or immediately followed by, a tumblerful of water, preferably hot, in all cases of indigestion. In one other respect there is no necessity to distinguish between the two forms of dyspepsia, and that is that constipation *must* be relieved, otherwise all other treatment will be in vain. The best initial treatment is a dose of calomel (say 3 grains of blue pill). Subsequent measures differ in the two forms, and will be referred to separately later. In other respects the two forms differ, and must be distinguished if treatment is to be satisfactory, so that we will now proceed to consider them apart.

Acid dyspepsia occurs chiefly in people otherwise in good health, active, and energetic, and who are seldom teetotallers; in people who have meals irregularly and bolt their food; and in anæmic girls. The tongue is firm, furred, and often somewhat fissured; the pulse is slow and full; the appetite is good, often voracious, and ever present, although on beginning to eat it may be quickly satisfied for the moment. The discomfort consists of a sense of fulness or weight in the pit of the stomach; a meal relieves the symptoms. The mental state is one of irritability; the discomfort is delayed—and this is an important diagnostic point—for some hours after a full meal, so that it is sometimes described as occurring before (the next) meals. As there is a sinking feeling in the abdomen, and as the next meal always gives prompt relief, the symptoms may be attributed to hunger. The idea then gains ground that the condition is due to debility, and that "supporting" is necessary. Large and frequent meals are taken, and so the vicious circle goes on. Eructations and even vomiting may occur, but if heartburn (a burning feeling extending up through the chest) is present, the case is certainly one of acid dyspepsia. In bad cases there is also pyrosis or waterbrash—*i.e.* a very free gushing of saliva from the mouth.

Atonic dyspepsia is a common condition among the working classes, and amongst neurotic persons of all classes; in weakly, convalescent, or overworked persons, who may be teetotallers, but who are usually excessive tea-drinkers. The tongue is pale, flabby, generally clean and glazed, and often indented at the edges; the pulse is quick and feeble; the appetite is poor, and often absent altogether, food being taken merely from a sense of duty; the discomfort consists of actual pain striking through to the back between the shoulder-blades; discomfort is practically always present, but it becomes very much worse within about half an hour of the taking of a meal.

All cases are not absolutely typical, of course, but if any mistake be made it is generally in diagnosing as atonic a case which is really of the acid type, because persons who have come down to pitying themselves dwell so much on the weakness which they feel, and, believing their symptoms to be due to debility, try to persuade every one else that this is so, and regard them as unsympathetic and ignorant if they do not agree and recommend "supporting" treatment. If you are in any doubt, treat the case as one of acid dyspepsia. You may do no good, but you will not aggravate the symptoms; whereas, if you treat a case of acid dyspepsia on the lines recommended for atonic cases, you will most certainly aggravate the discomfort.

Treatment.—1. *Acid Dyspepsia.* The treatment should be begun with a dose of calomel (3 to 5 grains), taken at night, and followed in the morning by a Seidlitz powder. Further constipation should be prevented by the regular use of cascara, or, probably best of all, by taking thrice daily *before* meals half a teaspoonful of sulphate of soda, dissolved in a glass of hot water, along with the bicarbonate of soda which has been already referred to as cleansing the stomach. Natural mineral waters should not be used; nearly all of them contain chloride of sodium (common salt) in considerable quantity, and the taking of it tends to the greater formation of hydrochloric acid in the stomach, the very thing we want to cure. For the same reason all salted foods must be avoided, and the habit—for it is nothing more—of taking salt with food stopped. Relief from symptoms, amounting practically to a cure, can then be obtained by the use of antacid and sedative remedies after meals, and one of the most convenient and satisfactory methods is the use of compound bismuth lozenges. A bottle of these can easily be carried in the pocket, and one should be sucked whenever the discomfort commences to be felt. This will be a varying time after meals—soonest after a light meal; more delayed, four or five hours, perhaps, after a full meal. As many may be sucked as is necessary to completely neutralise the discomfort. The sucking of them is important, because that stimulates a flow of alkaline saliva which also helps to neutralise the hyper-acidity. To obtain permanent recovery and freedom from the necessity of living on bismuth lozenges, the habits of the patient must become physiological. Meals must be taken with some degree of regularity, and be properly chewed, not bolted whole at a counter. If necessary, the condition of the teeth must be seen to. A certain amount of daily exercise is necessary, preferably out of doors, but not too soon after meals. Dietary tables need not be given, because no two persons will stick to the same things. We need only say that big dinners must be avoided, and light, easily-digested things taken; salt and condiments avoided altogether, and alcoholic beverages, if taken at all, in great moderation.

2. *Atonic Dyspepsia.*—The treatment of this form is not always so satisfactory, as the condition may be due to a constitutional lack of nervous energy, one manifestation of which is the inability of the stomach to secrete sufficient hydrochloric acid to carry out the digestive process. It is now known that the secretion of pepsin, the other necessary factor in stomach digestion, is very much less often at fault. The obvious indication is to supply acid after meals to aid the digestive process, and the following prescription, which also contains stimulating bitter tonics, will be found suitable in most instances:

℞ Dilute hydrochloric acid	6 drachms
Liquor strychninæ	80 minims
Compound tincture of cardamoms	6 drachms
Compound infusion of gentian	up to 8 ounces

Mix. A tablespoonful thrice daily immediately after meals.

If the person is anæmic, to this prescription may be added with advantage some iron, in the shape of 3 drachms of the liquor ferri perchloridi. In cases of long standing it will be found that this medicine, which is pretty strong, rather aggravates the symptoms at first, and, to enable the stomach to tolerate it to begin with, it is necessary to add to the prescription 2 drachms of the liquor morphinæ hydrochloridi; but, naturally, this ingredient must be omitted as soon as possible, because one does not want to run the risk of establishing a morphia habit.

For the constipation of this form of indigestion natural purgative mineral waters are excellent, and they are best taken in a glass of water on rising in the morning. Cheaper, but equally satisfactory in most instances, is a tablespoonful of sulphate of soda, together with a large pinch of common salt taken dissolved in the same way. Massage over the stomach sometimes helps considerably, and a change of scene and surroundings, if it can be obtained, is always helpful. The meals should be small, and the food particularly light and easily digested; but patients of this type usually know fairly well what they can take with comparative impunity and what they cannot, with one common exception, and that is tea. This is frequently taken to excess for its stimulating mental effect; but it ruins digestion if taken too often, in too great quantities, or too strong. The pernicious habit of taking it at a meal where meat is also taken is particularly to be condemned. Two (tea) cupfuls at breakfast and two at teatime should be regarded as a maximum allowance, and it should be freshly made, not black with standing or stewing.

Flatulence is a symptom associated with almost all cases of dyspepsia, and one which may be so disagreeable as to require special measures for its relief pending its disappearance, along with the other symptoms, when treated along the lines indicated above. An old-fashioned but often satisfactory remedy is charcoal, which can be obtained in powder or in the form of biscuits. A very palatable and excellent preparation is a French one known as "Biscols Fraudin," which is charcoal in the form of rusks, of which half to one may be eaten some time after each meal. Powdered charcoal is usually taken in teaspoonful doses thrice daily between meals. Another very satisfactory drug for flatulence is terebene, which should be obtained in 10 minim capsules, and one taken three or four times daily. This will be found excellent for relieving eructations, and also for stopping intestinal wind. Volatile oils act in a similar manner in bringing the wind away; hence the common employment of peppermint water or a few drops of oil of peppermint on sugar, or of a saltspoonful of compound cinnamon powder.

The form of dyspepsia sometimes called oxaluric dyspepsia belongs to the class of atonic dyspepsias, being characterised only by the presence of large quantities of oxalates in the urine. (See under Bladder.) Such a case requires treatment on the same lines as other forms of atonic dyspepsia, with plenty of exercise, and, if possible, a good bracing holiday.

Ear, Affections of the.—Conditions affecting the actual projecting ear, or auricle, such as eczema, tumours, &c., are not essentially different from similar conditions affecting the skin on other parts of the body, and are described either under their own particular headings or under Skin Diseases. Malformations of the ear can often be put right by small surgical operations. Very large ears, or ears that project in an unsightly manner, can often be put right in children by the wearing, especially at night, of a close-fitting band or cap over the ears. If this does not suffice, or if the condition has been allowed to persist until adult life, the ears can then only be fixed back by removal of a portion of skin behind the ear and stitching the ear back.

Conditions affecting the actual hearing apparatus, and the parts of the internal ear concerned with equilibration (for it must be remembered that the ear also performs this function), have to a certain extent been dealt with already under Deafness, and the chief causes of deafness—viz. wax, foreign bodies, eczema, boils, tumours, middle-ear catarrh, drugs, injury—described, and their treatment given.

Earache is a common symptom of ear troubles. In most instances it is due to acute inflammation of the middle ear; it may also come from wax, boils, eczema, or neuralgia affecting the canal into the ear. The pain from a bad tooth is sometimes referred to the region of the ear, so that the teeth should always be examined when earache is complained of. To relieve the pain, a hot fomentation should be put over the ear, and a small mustard-leaf or blister applied behind the ear. If not relieved by those measures in the course of six or eight hours, in the case of acute inflammation (see below) it is generally necessary to have the drum incised. The ear should not be syringed nor drops put in it. Earache due to wax, &c., or to a bad tooth, must, of course, be treated by attending to the causal condition.

Ringing in the ears, or *tinnitus*, may be a very disagreeable symptom due to an ear affection, but caused sometimes by more general diseases, such as gout or rheumatism, and only removable by treating the general disease. As a temporary condition it is not infrequently met with in people who have been overdosing themselves with quinine or salicylate of soda. In anæmia, and also in disease of the arteries affecting the arteries of the brain, throbbing or ringing in the ears is a not uncommon symptom. Wax in the ear, or catarrh or inflammation in the middle ear, may also be accompanied by ringing noises, and they are of common occurrence in that form of deafness coming on in persons exposed to loud noises in the course of their occupation. If the noises take the form of actual voices, then it is a sure sign that the person either is, or is becoming, insane. Ringing in the ears is therefore but a symptom of a number of different conditions, and the treatment must vary accordingly; but if it is very distressing, the following mixture may be tried, as it often has a special effect in diminishing the noises:

℞ Dilute hydrobromic acid . . . 2 ounces

Take a teaspoonful in a wineglassful of water thrice daily after meals.

Discharge from the ear, or "running ear" (or ears), if not due to eczema or boils in the canal of the ear, is invariably due to inflammation in the middle ear, and this is a condition to be treated in every case with seriousness. (See below.)

Middle-ear catarrh, which is practically always secondary to sore throat or cold in the head, is a form of inflammation spreading up the Eustachian tube to the middle ear, but without the formation of pus, or matter, in the ear. It may be suspected if a person who has a sore throat or a nasal catarrh becomes deaf without at the same time having earache. Such a person should keep in a room the air of which is warm and moist, keep on a light diet, abjure all tobacco and alcohol, inhale the steam from a jug of boiling water containing a teaspoonful of Friar's balsam for five minutes four times a day, and have gentle inflation twice a day to keep the tube open. This inflation is done with a large indiarubber ball or bag, known as a Politzer's bag, which is introduced into one nostril, the other being closed; then, as the person performs the act of swallowing (which opens the mouth of the Eustachian tube), the bag is squeezed. Inflation can also be done, though not quite so well, without any instrument, by simply closing the mouth, holding the nostrils, and then trying to expel air from the chest. The air can be felt entering the middle ear with a slight click, and often with a little ringing in the ears, and is followed by clearer hearing. The condition will usually improve rapidly with this; but if it seems to be getting chronic, a doctor should be seen as to any further measures, because, if allowed to become chronic, adhesions form between the little tympanic ossicles, and a very hopeless form of deafness ensues.

Middle-ear Inflammation.—1. *Acute.* Acute inflammation with suppuration, so that the middle ear becomes practically an abscess cavity, may arise in the course of a catarrh spreading up from a cold in the head, or it may come on during or after an attack of measles, scarlet fever, and other fevers. It is commonest in children. The symptoms are deafness, earache, and, if the condition has gone very far, a discharge of matter from the ear or ears. This condition is, unfortunately, considered by many people as not very serious beyond the temporary inconvenience arising from the earache. We would like to impress on our readers as strongly as possible the fallacy of this opinion, and the necessity of having the condition attended to as soon as possible. The condition is, as has been mentioned above, practically an acute abscess, and should be treated as such. The sooner the pus is let out by incision of the drum the better. It is better in every way to have this done early than to wait for it to burst through the drum itself, which it will almost inevitably do. The risks of leaving it, quite apart from the pain and discomfort, which are considerable, are: (1) spread to the mastoid cells (see below), involving a much bigger operation; (2) spread through the bony wall of the middle ear into the base of the skull, setting up meningitis or abscess of the brain. This is a very serious condition, but it is one which is only too often allowed to happen, the commonest cause of acute meningitis and brain abscess being acute middle-ear disease. (3) The condition is very likely to become chronic, with continual or intermittent discharge, and gradually increasing deafness. The risk of opening is nil, although it may have to be done under light anæsthesia. The perforation of the drum does not cause deafness, unless the perforation be very large, such as is likely to occur if it be left to rupture itself. Relief follows practically at once on incision of the drum, and the discharge may cease without any further treatment, although, as a rule, some syringing and dressing are required; but we need not go into the details of these, as a doctor will be in attendance to give instructions. After the attack is over the throat should be examined for the presence of adenoids or enlarged tonsils, as, if these are present and left untreated, recurrence is far from improbable.

2. *Chronic.*—Chronic inflammation may result from an acute attack, or it may be chronic from the start, in which case practically the only symptom is the presence, more or less constantly, of a discharge from one ear, or sometimes from both ears. The risks here are practically the same as in the acute form, and there is the same necessity for careful treatment under a doctor's supervision. Treatment will probably have to be prolonged, and consists of syringing and installation of various antiseptic substances into the ear. The patient or the friends can be taught to do most of it at home, but personal instruction and occasional examination by the doctor are essential. In some cases it is necessary for the surgeon to clear out the contents of the middle ear.

Mastoid Disease.—The mastoid cavity, or antrum, is a cavity in the mass of bone just behind the ear, and this cavity communicates with the cavity of the middle ear. Acute inflammation is very apt to extend from the middle ear to the mastoid. Occasionally the inflammation starts in the mastoid. The signs of mastoid involvement are pain, swelling, and redness behind the ear, in addition, usually, to those of acute middle-ear disease. The condition, being an abscess, must likewise be treated by opening and free drainage of the pus; but, as the abscess is inside bone, this is always rather a big operation. However, that cannot be helped, as, if left to itself, the patient would endure agonies, besides running even greater risks from the same complications as may follow acute middle-ear disease.

Giddiness, or *vertigo*, is another symptom which may be due to ear troubles. When it is so, it is characterised by the moving of objects round the patient in one or other direction, with staggering, ringing in the ears, and vomiting. The condition is not usually a very hopeful one to treat, but the prescription recommended for ringing in the ears may be tried, taking two or three times the dose mentioned there. For other causes of vertigo see under that heading.

Eclampsia.—The name applied to a form of convulsions occurring in pregnant women. (See PREGNANCY, COMPLICATIONS OF.)

Eczema.—Eczema has been defined by one eminent skin specialist as "the term commonly applied to any wet or scaly inflammation of the skin, of the cause or nature of which the observer is ignorant." This is very largely true even as the word is used amongst doctors, and it is still truer as it is used by other people, for to the man in the street practically any eruption on the skin may be "eczema." This naturally does not render the description of the disease or of the treatment easy. Any inflammatory condition of the skin, with the formation of pimples and blisters, weeping discharge, and itching, may be called eczema. The more chronic the condition is, the more dry and scaly does it tend to become, but acute attacks of it may come on at any time. Any part of the body may be affected, and the appearances in the same patient, at different times, and on different parts of the body, may vary tremendously. There are numerous skin diseases, whose causes are perfectly well known, which may, on certain parts or in certain stages, closely resemble "eczema"—we may instance "the itch" and ringworm—but which, their cause being known, cannot be regarded as eczema. The following are some of the main causes of eczema, although, strictly speaking, if we abide by the definition of eczema quoted, once the cause is known, then the disease should be labelled something other than eczema. Many are due to some external irritant, probably more than are suspected—*e.g.* such things as strong sun, or the rays of powerful arc-lamps such as are used in certain trades, cold winds, chemicals of various kinds, of which may be mentioned, on account of their frequent association with an eczematous condition of the hands and arms in particular, many of the chemicals used by photographers, soda, and strong or crude soaps, sugar as in baker's eczema, many hair lotions and dyes, dyes from stockings, irritants from plants, of which one of the best known is the Chinese primrose (*Primula obconica*), the mere proximity of which is sufficient to set up a violent attack of eczema in some people. With regard to other diseases, probably none actually cause eczema, but they can certainly aggravate it if present. Gout and asthma are very frequently associated with eczema, attacks of the three conditions sometimes alternating; dyspepsia aggravates an eczema already present, and anæmia makes eczema very indolent in character and difficult to get rid of. Some causes of eczema are definitely associated with nervous emotional states.

If the foregoing list does not put the sufferer on the track of some removable cause for his eczema, we would strongly recommend him to consult some physician who has special experience in skin diseases. Even *he* may not be able to discover the cause, but he should at least be able to give proper directions for treatment. Practically all cases of eczema are curable, if the right means be adopted; but here again we are in a difficulty, because no one treatment will cure eczema—in fact, almost no two cases can be treated exactly the same. The number of patent and quack cures on the market for eczema is an indication of the demand for them, but at the same time a sure proof that no one of them is a certain cure. We are convinced that, in the great majority of cases, it will be quicker and more satisfactory in the end to have expert advice at the start. Of course the person may be lucky in selecting something which suits his particular case right away, but it may be of some service if we indicate the broad general lines on which eczema should be treated.

Firstly, *general treatment.* If any irritant cause can be discovered, that, of course, must be avoided. Any dyspepsia, anæmia, or gout should be treated. (See these conditions.) With regard to diet, good plain food can be taken in most cases; the only things to be avoided are those which produce a great flow of blood to the skin. This includes, first and foremost, alcohol in any form, also curries, pickles, spices and condiments, or anything very hot; neither should strong mineral waters be drunk in large quantities, as is sometimes done. Hard water is not good for washing an eczematous surface, but it should be washed with soft rain-water at least once a day. There is less harm done by this than by allowing the secretion from the weeping surface to accumulate. Soap must not, however, be allowed to come into contact with eczema; the alkali liberated when even the best of soaps comes into contact with water is far too irritating. A handful of fine oatmeal should instead be used with the rain-water, and, after washing, a little simple cold cream should be smeared over the affected part. Exercise should be taken in moderation—not of such a violent character as to cause sweating, which aggravates eczema.

Secondly, *local treatment.* In the acute stage, when there is much itching as well as discharge, a lotion containing lead and tar will probably give as good results as anything. It must be applied in sufficient quantity to keep the affected part constantly wet without excessive thickness of covering. A single layer of lint should be used, frequently dipped afresh into the lotion.

℞ Liquor plumbi subacetatis	2 drachms
Liquor picis	$1\frac{1}{2}$ drachms
Zinc oxide	3 drachms
Rectified spirit	$\frac{1}{2}$ ounce
Distilled water	to 8 ounces

When the acute stage is past, the redness and itching largely gone, but considerable discharge still persisting, then Lassar's paste should be employed, spread on a piece of linen in a layer about one-eighth of an inch thick. Do not be penny-wise by spreading it on too thinly. In cases which have been allowed to run on until they have become dry and scaly, tar is one of the best remedies, used in a more concentrated form than in acute cases.

℞ Olive oil	2 ounces
Unguentum picis liquida	2 ounces

The ointment. Some to be rubbed well in each night.

Elephantiasis (Barbadoes Leg).—This is a disease met with in the tropics, especially the West Indies and South America. The legs are the parts of the body most often affected, although sometimes other parts are involved. As the name indicates, they become of enormous size, while the skin becomes thickened and warty. There is little or no pain, and really no discomfort beyond the awkwardness from the size, although the skin of the affected parts is very apt to become ulcerated. The disease may persist for years with no serious results. The condition is due to the obstruction of the lymphatic vessels by a worm (filaria), which gains entrance into the body through the agency of mosquitoes, in whose bodies one stage in the life-history of the worm is passed. The constant use of mosquito-nets in tropical countries is therefore to be recommended, not only on this account, but because of the various other diseases which are spread through the agency of these insects. Once the worm has gained entrance, no drugs have any effect on it. Firm bandaging and massage of the legs from below upwards may, in the early stages, diminish the swelling considerably, but in most cases surgical operation is required to get rid of the deformity. So long as the swelling is there, care should be taken to keep the skin clean and free from injury, as its vitality is low, and troublesome suppuration easily occurs on it.

Embolism means the plugging of a small blood-vessel by some material which has travelled through the larger vessels. One fairly common and serious form is embolism of a blood-vessel in the brain from a piece breaking off a diseased valve in heart disease, producing one form of apoplectic attack. This is referred to under Diseases of the Brain. Another form of embolism results from the breaking off of a piece of clot inside varicose veins or inflamed veins. Such clot is often large enough to stick in the heart or lung and cause sudden death. (See under Veins, Diseases of the.)

Emphysema.—A disease of the lungs coming on in persons who suffer from chronic cough from any cause, or in persons who blow wind-instruments, &c. (See Lungs, Diseases of the.)

Empyema means a pleurisy in which the fluid which forms in the chest is not a clear, watery fluid, but pus or matter. (See Pleurisy.)

Eneuresis in children means lack of control of the passage of water, so that they are constantly wetting the bed long after the age at which they should have gained control of the bladder (usually by the age of two years, and always by the age of three, if nothing is wrong). The condition is dealt with under Bladder, Diseases of the—*Incontinence of urine.*

Enteric Fever is another name for typhoid fever. (See Typhoid Fever.)

Enteritis means inflammation of the intestines. One of the chief symptoms is diarrhœa, and the condition is dealt with under that heading. (See also under Intestines, Diseases of the.)

Epilepsy means to most people the occurrence of fits, and while in many cases this is true, we would rather define it as a disease in which there are sudden attacks of unconsciousness, with or without convulsions or fits, for by no means all cases of epilepsy have fits. Transient attacks of unconsciousness without convulsive seizures are known as epilepsy minor, or more commonly by the French name of *petit mal;* the loss of consciousness, with general convulsive seizures or fits, as epilepsy major or *grand mal.* There is also a third, although somewhat rare, form of true epilepsy, which may be called *mental epilepsy,* in which there is neither fits nor real unconsciousness, but curious recurrent changes in conduct and behaviour. Any two or all of these forms of epilepsy may be present in the same individual. Localised convulsions, or twitchings in one limb or part of the body, occurring usually without loss of consciousness, are known as *Jacksonian epilepsy.* This is really quite a different condition, being due to some local cause on the surface of the brain, such as a tumour, a piece of blood clot, or a depressed fragment of bone, &c. Beyond saying that it is often remediable by operation, which ordinary epilepsy is not, we will not consider this form any further.

The cause of epilepsy is not known; something renders the brain unstable, so that " nerve storms," or uncontrolled discharges of nerve energy, take place, manifesting themselves in unconsciousness, fits, &c. The disease generally begins before the age of twenty, and in many cases at even an earlier period. So true is this that in epilepsy beginning in an adult one should always be suspicious of the presence of some definite local cause in the brain. Hereditary influences play a considerable part in the causation of epilepsy. Direct inheritance of epilepsy from a parent is not itself very common, but the children of neurotic families in which neuralgia, insanity, and hysteria prevail are certainly more liable to be epileptic than children of a sound, healthy stock. Chronic intemperance in the parents is another potent predisposing factor in the production of epilepsy, and so is the marriage of near relations. The sexes are about equally affected.

Symptoms.—1. *Grand Mal.* Preceding the fit there is, in about half of all cases, an *aura* or warning of the approach of the fit. This takes many different forms, although it is usually remarkably constant for any one individual. An uneasy feeling in the pit of the stomach is a common aura, another is a vague, dreamy sensation of something wrong. Sometimes it takes the form of a feeling of numbness or tingling in one hand, &c., a peculiar taste or sensation of colour, or some definite movement. Whatever it may be, it may give sufficient warning to enable the patient to sit down or to put himself in a position of safety. At the onset of the fit the patient usually utters a loud cry or groan, then drops as if shot, making no effort to guard the fall. The first stage is one of rigidity, the head being thrown back, the hands clenched, the arms bent, and the legs extended. The face, at first pale, soon becomes livid, whilst the eyes are fixed and staring, the pupils widely dilated, and no blinking occurs if the eye is touched with the finger. This stage lasts a few seconds, and is followed by the convulsive stage, in which jerking movements, often of a violent character, occur. The limbs are tossed about, the face twitches, the eyes roll, the eyelids open and shut, and the tongue is apt to be bitten. The patient froths at the mouth, the froth being blood-stained if the tongue has been bitten. Urine is often passed involuntarily, and sometimes the bowels open also. This stage usually lasts two or three minutes, then the convulsions become less marked, and the patient sinks into the third and last stage of the attack, that of somnolence. In this he is at first, as a rule, really comatose—*i.e.* unconscious. After a variable time he can be aroused, but, if left alone, as he should be, he sleeps on for some hours and then awakes, usually complaining of some headache, or is in a state of slight mental confusion. Sometimes, in very bad cases, instead of the third stage coming on, fit follows fit, the patient never recovering consciousness between them. This " status epilepticus," as it is called, is a serious condition, and may be fatal.

Attacks may occur at night and during sleep only, and a person may be subject for years to nocturnal epilepsy and never know it. Suspicion is usually aroused by the patient awaking with a headache and mental confusion, the tongue perhaps bitten, and the bed wet from urine having been passed.

2. *Petit Mal.*—Practically all epileptics are subject to petit mal, and in some cases it is the only manifestation of epilepsy. The attack consists in the sudden loss of consciousness for a few seconds, during which time the patient may be quite unaware that anything has happened. Seated talking, for instance, he suddenly stops for an instant, the face turns slightly pale, and the eyes become fixed, then he resumes the conversation, or whatever he may have been doing, as if nothing had happened. In most cases of petit mal, grand mal ultimately develops.

3. *Mental Epilepsy.*—After attacks of either of the preceding forms the patient may suffer from hallucinations, or be in a trancelike condition, in which he may perform actions of which he has subsequently no recollection whatsoever. These may be harmless automatic actions, such as scratching the head; they may be more awkward, such as undressing, quite oblivious of the surroundings in which the patient may be for the time being; or they may be violently maniacal or even homicidal. Such a person is, of course, not responsible for his actions performed while in such a state. Sometimes these automatic actions and curious alterations in behaviour seem to replace entirely the typical epileptic attack. In such states the patients may seem dazed and peculiar, but they appreciate their surroundings and answer questions properly. On the other hand, their state of consciousness is not normal, for after the attack is over there is no memory of anything done or said during the attack. Such states, when they last a long time, as may occur, give rise to the curious condition of " double consciousness," in which the individual has practically two personalities, the one of which knows nothing about the other. At other times these mental epileptic attacks may assume the same bizarre or serious characters which characterise their occurrence after typical fits.

The general mental condition of epileptics varies exceedingly. In those in whom the attacks are few it may be quite unaffected, and epilepsy is quite compatible with mental brilliance, some of the world's greatest men having been epileptics. Where the fits are frequent, mental impairment is almost sure to follow ultimately; sometimes it is a mere dulling of the intellect, sometimes actual insanity or imbecility. The mental impairment appears to be more pronounced in those who suffer from many petit mal attacks than in those in whom epilepsy takes the form chiefly of actual fits.

The frequency of epileptic attacks varies enormously, from one attack in a number of years, through all stages of severity, up to several hundreds a day, including both grand mal and petit mal seizures. A typical epileptic fit can scarcely be mistaken, the only thing which is likely to be confused with it being a hysterical fit. In the latter the attack only occurs in the presence of bystanders who may be expected to be sympathetic; the fall is always carefully arranged so as not to hurt, the tongue is never bitten (although an onlooker may be), urine is not passed, the convulsions are usually overdone, and they go on for a much longer period than in the case of epilepsy.

The outlook in epilepsy cannot be described as bright. Death seldom occurs in a fit, but the possibility of a cure is not often very great. It is more favourable when epilepsy begins in early adult life than when it starts in childhood, and also when treatment is begun before the attacks have lasted very long. Of course it must be remembered that there is always a risk of a person being injured should a fit take place in any situation where a fall exposes him to risk.

Treatment.—For the actual fit little can be done beyond preventing the patient injuring himself by the violence of the movements, loosening tight clothing round the neck, and inserting a cork or pad of some sort (a rolled-up handkerchief does very well) into the mouth so as to prevent the tongue from being bitten. Leave the patient undisturbed when he passes into the sleepy stage. If, on waking, the headache is very severe, it may be relieved by a 10-grain phenacetin powder. Should one fit succeed another a doctor should be sent for, because it leads to great exhaustion, and may even be fatal if not checked, and strong measures will be necessary.

For the disease the *general treatment* is as important as the drug treatment. Regularity and moderation should be the guiding principles. Over-eating must be avoided, and the diet should be plain and simple; meat in particular must be taken sparingly, never more than once a day, and in many cases a purely vegetarian diet suits admirably. Alcohol must be forbidden altogether, and smoking, if indulged in at all, must be in moderation. A salt-free diet has of late been recommended, the idea being that the patient is thereby more easily got under the influence of the bromides which form the stock medicinal treatment, but there is as yet not sufficient evidence to show whether it is of great value or not. Certainly it is often rather impracticable when the epileptic has to live at home. Light outdoor occupation and exercise is highly advisable, and of all trades that of gardening or farming is certainly the most suited to an epileptic. School education is often an impossibility for the epileptic child, but, if it be at all possible, children should be gotten into some one or other of the various colonies which have now been established in various parts of the country. In these the child receives education according to its capabilities, is taught a suitable trade, receives treatment, and leads a regular life in the open, free from excitement and worry, and becomes, as far as possibly can be, a useful citizen, instead of a burden on the parents or the general community. So far, unfortunately, the number of sane epileptics for whom there is room in these colonies is much less than that of those who would benefit by admission to them. The insane epileptic can only be dealt with as any other insane person: if harmless, he may be kept at home, if he can be properly looked after; if dangerous to himself or others, he must be sent to an asylum.

For the *medicinal treatment* of epilepsy many drugs have been tried and recommended, but the medicine which has proved most satisfactory in reducing the frequency and severity of the fits is bromide of potassium, or some other salt of bromine. The particular bromide which will suit the particular case best has often to be found by experiment, and the amount and time of dosage will also have to be found out by trying. Treatment requires to be so prolonged in every case that it is advisable for the patient to keep a book in which are recorded the number of fits, the time of occurrence, any special circumstances connected with them or which may have played a part in bringing them on, and in which the physician should enter all details of treatment. As a sort of guide we might suggest that 40 grains of bromide of potassium dissolved in half a tumblerful of water be taken at night regularly. Afterwards it may be increased or diminished according to circumstances, the great point being that sufficient is taken to keep the attacks in check, and, if possible, in abeyance altogether. Bromide must be persevered with regularly for at least a year after the disappearance of the fits. A few days' holiday from bromide must be taken every few weeks, however, and, should its administration bring out a rash, which not infrequently happens, it may have to be stopped or diminished in amount, or something else added to it which may prevent the rash coming. Should the fits not be prevented, or at least materially diminished, by the bromide of potassium, other bromides must be tried, or, in some few cases, other drugs altogether will be found more satisfactory.

Epistaxis means bleeding from the nose. In most cases this is slight, and easily stopped if the patient sits or lies down quietly, and applies or has applied cold things to the back of the neck and to the face and nose. Cold metal, such as a key, to the back of the neck answers the purpose well, provided that it is changed when it becomes warm, which will not be long. A sponge or handkerchief wrung out of cold water, iced if possible, and laid over the nose does best in front. The patient should also suck ice or sip cold water, and refrain from blowing the nose. If the bleeding is arrested, the patient should remain quiet for a few hours, and take any food cold. If the bleeding is not checked by the application of cold in this fashion, it will be necessary to send for a medical man to plug the nose. Should the bleeding be recurrent, it will be advisable to be examined by a doctor, because it may be due either to some constitutional trouble or to some local disease in the nose requiring treatment.

Epithelioma.—The name applied to cancer arising from the epithelium covering the surface of the body—*e.g.* the skin or the epithelium lining the mouth. Two of the commonest situations for its occurrence are the lip and tongue, and any little wart-like growth or ulcer appearing in these situations in adults or elderly persons should be regarded with suspicion. If cancerous, early and thorough removal is necessary. (See TUMOURS and CANCER.)

Ergot Poisoning (Chronic).—Ergot is a fungus which grows on rye, and, in countries where rye forms an important article of the dietary, such as Russia, bread made from diseased rye may give rise to widespread epidemics of ergot poisoning. The main action of ergot is to constrict the blood-vessels (for which purpose it is used medicinally to check hæmorrhage, especially after confinements), and, if taken for any length of time, the parts of the body farthest from the heart—such as the fingers, toes, and ears—receive so little blood that, after a period during which they are very blue and cold, they mortify, turn gangrenous, and drop off. The treatment is simply to stop the use of the diseased rye-flour.

Eructation, or belching, means the sudden expulsion of gas from the stomach by way of the mouth. The gas may be offensive in odour, in which case it is generally due to indigestion or to fermentation going on in a dilated stomach. (For other associated symptoms and treatment see under DYSPEPSIA, and STOMACH, DISEASES OF THE.) If the gas is odourless, consisting chiefly of air, it is simply the bringing up again of air which has been swallowed. Gulping down of air may occur in acid dyspepsia, but it is very often simply a nervous bad habit occurring in nervous or worried people. It is not always easy to get the habit broken, but it will help greatly if they will keep a cork between their teeth for as much of the day as they can, because then they cannot swallow air. A few days of this may give them the necessary start in breaking off the habit by power of will. This form of nervous eructation is sometimes accompanied by the bringing back of solid food to the mouth, where it is again chewed and swallowed. This rumination, involuntary at first, may later become voluntary by custom, and in a person who is not very strong-willed is very difficult to check. A rest-cure is often advisable.

Eruptions.—An eruption or rash appears on the skin in many of the fevers, the chief ones being measles, German measles, scarlet fever, erysipelas, typhus, typhoid (slight), chicken-pox, smallpox, and epidemic cerebro-spinal meningitis (sometimes). As a rule the character of the eruption is very distinctive for each disease, but in some cases, especially mild cases, it may be very difficult to be sure from the character of the rash alone. The amount of eruption is very often proportional to the severity of the attack. The characters of the eruption or rash will be described under the different diseases. Most skin diseases are accompanied by an eruption of some sort, and here again the character of the eruption is a great help in the diagnosis; but in the case of skin diseases the eruption may take different forms on different persons, or on different parts of the body, to a much greater degree than in the case of the eruption of a fever. The eruptions of skin diseases are usually much more chronic and unaccompanied by fever and general disturbances of the health (although there are exceptions to this), although some are very transitory, such as nettle rash. It must not be forgotten, also, that some "chronic" eruptions are due not to any actual disease of the skin, but to some general or constitutional disease, such as syphilis, scurvy, or purpura.

Erysipelas (and Cellulitis).—An acute contagious inflammation of the skin and subcutaneous tissues, characterised by fever and the presence of a bright-red rash on the affected area, the whole part being usually hard, swollen, and brawny, and often with blebs or glisters on the surface, the edge of the affected area being raised or rampart-like. *Cellulitis* differs in that the deeper loose subcutaneous cellular tissue is more affected, the whole part becomes much more swollen, but the skin is not so typically rose-red, nor is cellulitis in most cases so contagious as ordinary erysipelas.

Erysipelas, sometimes called "the rose" from the colour of the rash, is due to an infection of the deeper layers of the skin, and of the subcutaneous tissues, with a special form of germ belonging to the class of bacteria called "streptococci." It is a disease of cold or temperate climates, and is commonest during the spring and autumn months, although cases may crop up at any season. It occurs oftenest in connection with wounds, but may occur, without any obvious injury to the skin, in persons living in insanitary surroundings, or in those who are alcoholic in their habits, suffering from diabetes or Bright's disease, or debilitated from any other cause. Apart from its occurrence in connection with wounds, the face is the commonest site of erysipelas, starting especially about the corners of the mouth, nose, or eyes. The infective agent, when carried to other persons from a case of erysipelas, may cause in them erysipelas, cellulitis, general blood-poisoning, or, in women after confinement, puerperal fever.

The *symptoms* are usually ushered in by a feeling of chill, headache, and general discomfort for a period of about one day, with some degree of fever. Then the bright rose-red rash appears, often on the face or round some wound. The rash disappears on pressure, and it is accompanied by a feeling of burning and stiffness, scarcely amounting to pain, except where dense structures like the scalp are involved. The affected part is always somewhat swollen, and pits on pressure; in the case of loose tissues like the face (and especially round the eyes) the swelling may be so great that the features are quite unrecognisable. Blebs and blisters containing watery fluid usually appear on the affected surface; sometimes pus is found in these blebs, and in some cases suppuration goes on in the deeper cellular tissues also. The edge of the rash is usually fairly well defined, raised, and hard. The rash gradually spreads from the first affected part, fading from them as it spreads, and leaving a slight brownish stain. Neighbouring lymphatic glands are often enlarged and painful. The temperature remains raised (it may be up to 103° F. or 104° F.) so long as the rash persists. The duration is very variable; it may only be for three or four days, the temperature falling suddenly by crisis, and the rash quickly disappearing; or it may be for one, two, or even three weeks, and relapses are not uncommon. The patient is often a little delirious at nights, and may be wildly so in scalp cases.

The outlook in erysipelas is usually favourable, except in debilitated or elderly persons, or in infants who are also subject to attacks of erysipelas during the first few weeks of life. It is most dangerous when about the head, because it may spread through into the brain, causing meningitis. A curious fact is that chronic sluggish wounds and ulcers, which before the attack would not heal, after it may heal with remarkable rapidity, and even malignant tumours such as sarcoma may disappear. This fact is sometimes made use of, inoperable growths being infected artificially with erysipelas, and in some cases a cure may result.

Treatment.—A doctor should always be in attendance. The disease is one of the scheduled notifiable diseases, and must be notified by him to the public health authorities. All cases should be isolated, sheets kept moist with 1 in 40 carbolic lotion being hung round the bed or over the door of the room in which the patient is. The general treatment consists in keeping up the patient's strength with as nourishing food as can be taken. Sometimes this gives little trouble, the patient being able to eat almost anything; in others only beef-tea, strong meat-soups, milk, egg-flips, and the like, can be taken. In these cases alcohol has often to be given pretty freely. Internally it is usual to administer full doses of iron, say 20 drops of the tincture of the perchloride of iron in a little water thrice daily after food. Anti-streptococcic serum is now often employed, but the ordering and mode of administration of this must be left to the medical man. The best local application is ichthyol, which may be applied in the form of an ointment (25 per cent. ichthyol in lanoline), spread fairly thickly on lint and applied twice or thrice daily. It is a black, messy application, but a very satisfactory one. If on a suitable place, which the face is not, an effort may be made to limit the spread of the inflammation by painting the skin an inch away from the edge of the rash all round with tincture of iodine. The ichthyol application should also extend wider than the actual inflamed part. If suppuration occurs—and this is most likely to happen with the deeper cellulitises—numerous incisions may be necessary; and in the case of a limb it is often immersed in a bath of boracic lotion, and kept in this, it may be, for days.

Exophthalmic Goitre.—A form of goitre or swelling of the thyroid gland in the front of the neck, in which there is also great protrusion or prominence of the eyeballs (exophthalmos), rapid action of the heart, and tremulousness. (See under GOITRE.)

Expectoration.—The character of the sputum is sometimes a clue to the nature of the disease producing the sputum which is expectorated. The presence of any sputum requiring to be expectorated is practically always indicative of something wrong, although it may be a very slight catarrhal condition. We do not refer here, of course, to the expectoration of saliva, a common but quite unnecessary and filthy habit, and not only disgusting but often dangerous, as, should the person have any disease of the lungs, the germs are thereby spread far and wide. In particular, consumption is now known to be spread largely by the habit of spitting. It should be mentioned, in the first place, that in children under about the age of seven the sputum is usually swallowed, and does not appear. Sputum may come from the nose; this is commonly the case in colds in the head, when the secretion may be partly swallowed and then expectorated. The patient should, of course, be able readily to recognise this fact. Sputum coming from the nose is similar to sputum coming from the throat in character. In the acute stages of a cold in the head or of a sore throat it is yellowish or purulent, but in more chronic conditions it is thick and sticky, with black specks from the presence of inhaled dust particles. A watery, frothy sputum, brought up in considerable quantity, occurs in bronchitis, but if so frothy that it resembles water made frothy with soap, it is practically conclusive of pulmonary œdema or dropsy of the lung, such as is apt to come on in the late stages of heart and kidney disease. In the later stages of bronchitis the sputum is a mixture of frothy mucus and streaks of yellow pus. A rusty-looking sputum, extremely viscid and sticky, is very characteristic of the onset of pneumonia. The so-called nummular sputum, which looks like a number of buttons or coins floating in water, is very suggestive of the presence of cavities in the lung, usually due to consumption. A sputum looking like prune-juice is seen sometimes in the later stages of pneumonia; it is rather a bad sign. Sputum looking like red-currant jelly is found in cancer of the lung. A very black sputum is found in miners or persons who have inhaled smoke or coal-dust for long periods. The sputum may be very foul-smelling in gangrene of the lung, or in the condition called bronchiectasis. Spitting of blood-streaked sputum is in most cases due to consumption, but as this is not the only cause, and as it might cause unnecessary anxiety if every case of hæmoptysis, or spitting of blood, were immediately put down to consumption, we must refer in a little more detail to this. It is necessary, in the first place, to exclude the nose and the mouth as possible sources of the blood, also vomited blood. Vomited blood is black like coffee-grounds, whereas blood coughed up is bright red and frothy. In acute bronchitis and in whooping-cough the sputum is sometimes streaked with blood from the stress of coughing. This never lasts long, however. In late stages of heart disease there is often some streaking of the sputum with blood, or even considerable quantities of blood. Diseases of the blood—purpura, scurvy, hæmophilia, &c.—may be responsible for bleeding from the lungs just as from any other part. The blood may come from an aneurism of the aorta eroding through into a bronchus; in this case death from rupture cannot be far off. In a few other conditions of the lungs spitting of blood may occur, but, after all, most hæmoptysis cases are due to consumption, and, unless some other cause can definitely be found, the individual must be considered at least as a "suspect," although it is necessary sometimes to wait for some time before definite signs appear. (See BRONCHITIS, CONSUMPTION, LUNG DISEASES, &c.)

Eye, Diseases of the, and Affections of Vision.—Many of the diseases affecting the eye or the power of vision are of an intricate nature, requiring the services of a specialist for their proper detection. Some are beyond the power of any one to cure; some, on the other hand, may be greatly relieved or even cured, but the treatment is in many instances only possible by some one skilled in such work. The eye is a very delicate piece of mechanism, and harm can easily be done by unskilled attempts at treatment. Under these circumstances it will only be necessary to refer to some of the more common and obvious conditions affecting the eye or the eyesight, in which some, if not all, of the treatment may be carried out at home, and to indicate briefly what some of the other symptoms associated with the eye may indicate, where treatment is necessary (especially if it be urgently required), and to indicate what the treatment may be.

Affections of the Eyelids.—*Blepharitis*, or *inflammation of the margins of the lids* where the lashes grow out. In this condition, which occurs at all ages but is specially common in children, the margins of the lids are swollen and reddened, whitish scales are present at the bases of the lashes, or, in bad cases, there are yellow crusts gluing the lashes together, and on removing the crusts small ulcers are seen. There will probably be itchiness, soreness, wateriness, and some sensitiveness to light. The condition is rather a chronic one, and is due to lack of cleanliness, bad hygienic surroundings, general debility, previous attacks of measles and other fevers, and sometimes to uncorrected errors of refraction—*i.e.* lack of spectacles. If not cured it may lead to permanent loss of the lashes, turning out of the lids, and a bleary-eyed appearance. Removal of the cause, if possible, is of the greatest importance in treatment. The crusts or scales must be removed by dabbing with cotton wool soaked in warm water in which a little bicarbonate of soda has been dissolved. Then wash gently but thoroughly with soap and water, dry, and apply, fairly thickly, night and morning, yellow oxide of mercury ointment.

Stye.—A stye is practically a little abscess forming about the root of an eyelash. A red swelling appears at the margin of the lid; it is painful and tender. Very soon a yellow point will be seen on the swelling, indicating the formation of pus. Styes occur at all ages, but are commonest in young adults. They are often associated with a run-down state of health, and also with uncorrected errors of refraction. Occasionally they may be prevented from coming to a head by the assiduous application of cold compresses, but not very often. If this be attempted, the individual must give up his whole time to wringing cloths out of cold water and changing them whenever they begin to get warmed up, which will be in the course of a few minutes. Hot fomentations or poultices applied over the eye hasten their development. As soon as the yellow spot is seen, the pus should be allowed to get out by pulling out one or more eyelashes. (They grow in again.) If you do not care to do this, or to have it done, a doctor can easily let the pus out through a tiny incision, so that it leaves no noticeable scar. To obviate recurrence, a holiday and tonics, such as Easton's syrup (half a teaspoonful thrice daily after meals), should be taken, if necessary, or the eyes examined to see whether spectacles are required.

Chalazion or *Meibomian Cyst.*—A cyst formed by the blocking of the duct of one of the meibomian glands of the eyelids. This forms slowly, taking perhaps months to reach the size of a pea. The swelling is hard, usually quite painless, fixed to the lid, but the skin moves freely over it. Sometimes suppuration occurs in them, but, as a rule, they are merely annoying because of the disfigurement. Small cysts can sometimes be got rid of by the frequent application of yellow oxide of mercury ointment to the lid, and massage or rubbing, but if of any size they have to be incised from the inside of the lid and the contents scraped out.

Turning in of the eyelashes (*trichiasis*), or *turning in of the edge of the eyelids* (*entropion*), may come on after conjunctivitis, burns, blepharitis, trachoma, &c. The symptoms are due to mechanical irritation of the front of the eye by the misdirected lashes. They are: irritation, pain, excessive flow of tears (lachrymation), sensitiveness to light (photophobia), and sometimes actual ulceration of the front of the eye. The turning in of the lashes or lids is, of course, obvious. Some form or other of operation is almost always required.

Turning out of the eyelid (*ectropion*), with exposure of more or less of the conjunctival surface, may, like the previous conditions, affect one lid or both upper and lower lids. The condition is an obvious one; the chief complaint is usually the overflow of tears on to the face (epiphora), causing excoriations and eczema of the lower lid. It may result from a number of different causes, such as blepharitis, burns, conjunctivitis, simple relaxation of the skin in old people, or paralysis of the facial nerve (lower lid only). In the senile form the patient, when wiping away the tears, should be careful to wipe upwards and towards the nose, not downwards and away from the nose. A suitably applied bandage will sometimes keep the lid in position, but in many cases a small operation is necessary.

Ptosis—i.e. *drooping of one or of both upper lids*—interferes with vision by covering the pupil. To get over this patients throw the head back, and attempt to pull up the lid by wrinkling the brow. It is always due to paralysis of the third cranial nerve, and may be an isolated symptom, or, more commonly, associated with paralysis of some of the movements of the eyeball, or of still wider extent. In any case a medical man should be consulted as to the causation of the paralysis and its treatment.

Affections of the Lachrymal Apparatus.—The secretion of the lachrymal gland, after lubricating the front of the eye, normally escapes through two minute openings which can be seen, one on the margin of each lid, near the inner corner of the eye. These open into a common sac, which in its turn opens into the nose through a duct about three-quarters of an inch long. The chief trouble in this part of the eye is *epiphora* (watery eye), or the overflow of tears on to the cheek. This may be due to excessive secretion as in weeping, or from the presence of dust or any foreign body in the eye, irritation from smoke, or conjunctivitis. Another common cause is chronic inflammation of the sac and duct through which the tears should escape; in such cases surgical treatment is necessary—syringing, or dilatation of the channel. Ectropion (see above) is a common source of epiphora, because the opening in the lower lid is then not kept in contact with the fluid in the conjunctiva.

Affections of the Conjunctiva—*i.e.* of the membrane lining the inner surfaces of both lids and covering the whole of the white of the eye. Most affections of the conjunctiva fall under one or other forms of inflammation of it, or *conjunctivitis.* One of the symptoms common to most forms is that the eye looks red and bloodshot, but in this connection it is necessary to distinguish between the reddening due to conjunctivitis and that due to affections of deeper parts of the eye, such as iritis. In conjunctivitis the reddening is most marked near the junction of the insides of the lids with the white of the eye, fading as we approach the central transparent cornea, and the redness can be moved with the conjunctiva by pressing on the outside of the lower lid. In the other case the redness is most marked immediately round the cornea, fading as we approach the lids, and it cannot be moved by pressing the lower lids. In some severe inflammatory conditions affecting more or less of the whole of the front part of the eye, both sorts of injection of the blood-vessels, and consequent reddening, may be present.

Catarrhal Conjunctivitis.—In the acute form there is a sticky mucous discharge, which tends to accumulate during the night and glue the lids together. The eyes are bloodshot, they feel hot, itchy, and smarting, as if there were sand in them. There is usually also photophobia, though not so intense as in iritis. The condition may be limited to one eye, but usually both are affected, either from the start or after a day or two. This form occurs at all ages, and the causes are numerous. They may be divided into: (1) Mechanical—*e.g.* foreign bodies, strong winds, smoke, strong lights such as arc-lamps or reflection from snow (snow-blindness). Photophobia and lachrymation are intense in this last form. (2) Epidemic—due to certain germs. This form is contagious, apt to spread through a school or household, and is commonest in spring and autumn; accompanying such fevers as measles, scarlatina, and smallpox; associated with cold in the head, hay-fever, and influenza by spread up the tear duct from the nose. This form tends to get well of its own accord, but treatment shortens the duration and prevents it becoming chronic, as may happen. Cloths wrung out of very cold or iced water should be applied to the eyes for about half an hour thrice daily; the eye should be frequently bathed with boracic lotion, which can be done by applying a special eye-bath to the eye and opening the eye in it, or simply by turning the lower lid slightly down and dropping a little of the lotion in, repeating the dropping several times. Some vaseline or boracic ointment should be smeared along the edges of the lids at night to prevent them sticking. If there is any photophobia, the patient should remain in a darkened room; this is much better than covering up the eyes. The discharge had better always be regarded as contagious (as it really is so in very many instances) and destroyed, and everything coming in contact with the eyes disinfected. Should the condition not clear up in a few days, or in a fortnight at most, medical advice should certainly be obtained, if it has not been got before, because stronger remedies will be necessary. The same advice applies to cases chronic from the outset. In these there is very little discharge, but the symptoms otherwise are much the same. Somewhat prolonged and varied treatment may be necessary in chronic cases. The same advice will also hold good for that special form known as follicular catarrh, in which, in addition to the above-mentioned symptoms, there appear on the inner surface of the lower lid a number of pale round granules about the size of a pin-head. This closely resembles trachoma.

Purulent Conjunctivitis.—This form is due to gonorrhœa. (See under Venereal Diseases.) It occurs in adults as a direct infection from the gonorrhœal discharge. After one or two days of intense redness, swelling, and tenderness of the conjunctiva, the profuse yellow purulent discharge appears. It is a serious condition, and medical aid must be obtained. This disease may also occur in the new-born as a result of infection of the eyes from the presence of gonorrhœa in the mother. It is a dreadful condition if not recognised in time, and is responsible for a large number of cases of total blindness. Fortunately it can easily be prevented by cleaning the eyes of the child with water immediately after birth, and then dropping in one drop of a 2 per cent. solution of nitrate of silver. This should certainly be done in every case where the mother has any discharge, and it is a safe practice to carry it out as a routine in every birth, as it can do no harm beyond causing a little redness of the conjunctiva for perhaps a day or two. Should the eyes of any recently-born child show any sign of inflammation, the sooner the doctor's help is obtained the better.

Membranous or Diphtheric Conjunctivitis.—A rare but serious form sometimes seen in children, in which a membrane forms over the front of the eye. It may destroy sight, and may even be fatal. It is contagious, and must be isolated like ordinary diphtheria of the throat. Naturally the doctor is required.

Trachoma, Granular Conjunctivitis, Granular Lids, or *Egyptian Ophthalmia.*—A chronic form not seen much in this country except amongst immigrants from Eastern Europe, where the disease is rampant, as it is also in Egypt and Arabia. At first there may be very little in the way of symptoms; when there are any, they are simply those of simple conjunctivitis. If the inner surface of the lids be examined, they will be found to be covered with greyish or yellowish granules. There is not much discharge, but what there is is contagious. So many disastrous complications may follow, including partial or total blindness, that serious efforts are being made to prevent the spread of the disease to other countries. In the United States, for example, no person with trachoma is allowed to enter the country. Prolonged and thorough treatment, of a kind which the patient cannot carry out himself, is necessary. The patient and his family must remember the contagiousness of the secretions, and keep his handkerchiefs, towels, wash-basin, &c., separate.

There are some other forms of conjunctivitis recognised, but they scarcely call for description here.

Foreign bodies in the conjunctiva and injuries to it are common. These are considered in the section dealing with First Aid. We need only say here that, if foreign bodies are not easily got out, too much poking at the eye must not be indulged in, because more harm than good may be done. If the foreign body has gone deeper than the conjunctiva, and become firmly fixed in the eye, unskilled efforts should not be made to get it out.

Affections of the Cornea—*i.e.* of the central transparent part of the front of the eye. The cornea is liable to be the seat of inflammation (keratitis), of ulceration, of various conditions causing loss of transparency, of bulging, and to have foreign bodies, such as pieces of metal, becoming embedded in it. These conditions may be serious, and lead even to destruction of the eye should the cornea be perforated, or to complete blindness should it become opaque, so that no time should be lost in seeking advice.

Affections of the Iris—*i.e.* of the curtain of the eye, or coloured portion behind the cornea and surrounding the central hole or pupil. Most affections of the iris fall under the heading of *iritis*—inflammation of the iris of some sort, either acute or chronic. The symptoms are pain, often severe, neuralgic, or shooting in character, radiating to the forehead and temple, and worse at night; the eyeball is often also tender on pressure; photophobia, lachrymation, and some dimness of vision. The iris looks dull and lustreless; the pupil is usually small, and often does not contract when exposed to light, nor dilate freely when the light is cut off; it is often irregular in outline instead of being perfectly circular. There is always a red zone of inflammation round the cornea. (See note on bloodshot eyes at the commencement of Conjunctivitis.) In acute cases it is always necessary for the patient to rest in bed in a darkened room, and usually to have drops of atropine put in the eye; but the condition may be a serious one, and a doctor should be called in. Iritis due to foreign bodies perforating the eye just about the junction of the cornea with the white of the eye is often particularly dangerous, because a form of sympathetic ophthalmia may start in the other eye, rendering it necessary to take out the first to save the other. Simple iritis often affects both eyes, one perhaps several days after the other, but this is not of the same dangerous form.

Any *inequality in the size of the pupils*, or absence of contraction in the pupil when a bright light is thrown on it, is usually indicative of some disease of the nervous system.

Glaucoma is a disease of the eye affecting chiefly persons over fifty. It may occur in an acute form, but usually it is a chronic disease, and may have lasted for some time before the person suspects anything wrong. The eye may look perfectly normal, but there are usually periods when the patient complains of symptoms such as foggy vision and coloured halos round lights, and it should always be suspected when an elderly person finds that the glasses have frequently to be changed for stronger ones. In the acute form, or in the acuter periods of the chronic form, the patient may feel considerably out of sorts, and may mistake such attacks for simple bilious attacks. The disease, if allowed to go unchecked, leads to progressive diminution in the power of vision, ending in blindness. The explanation of the condition is an increase in the tension inside the eye, causing the eyeball to feel harder than normal to the touch, but what causes this increase in tension is not quite certain. The treatment usually required is operative, cutting a little hole in the iris to diminish the tension. One thing which must *not* be done, under any circumstances, is to put atropine drops into the eye. This is a common remedy for a number of eye conditions, but it renders a glaucoma much worse, and may precipitate an acute attack, leading to complete loss of vision. One must always be careful, in ordering elderly people atropine, to see that there is no tendency to glaucoma.

Affections of the Lens.—The chief disease here is cataract, which is dealt with separately. (See Cataract.)

Muscæ volitantes, or *specks floating before the eyes*, is a condition present in all eyes to a certain extent under certain circumstances, such as looking at a bright uniform surface or in looking through a microscope. They are found more frequently in persons with short sight, and temporarily during digestive derangements. They are annoying, and sometimes alarm patients, but are really of no importance, and do not affect the acuteness of vision. They must be distinguished from the specks of early cataract, which are fixed in position, not floating. The treatment consists in having any error of refraction corrected by spectacles, or in having the indigestion relieved. They may persist until the patient ceases to look for them, and thus forgets their existence.

Affections of the back of the Eye—*i.e.* of the *retina* and of the *optic nerve*, the nerve to the eye. These, as a rule, present no appearances visible on ordinary examination of the eye, but can only be recognised by examining the eye through an ophthalmoscope. The chief symptom leading the patient to consult a doctor is usually diminution in the acuteness of vision, varying in amount, but in some cases being practically blindness. This is sometimes most marked in the daytime, sometimes most marked at night or in a feeble light. There may also be alterations in the shape of objects and a feeling of discomfort in the eye, but rarely pain. Affections of this part of the eye may be merely local eye trouble, due, for instance, to an extension backwards of such a disease as iritis, but very often they are manifestations of some more general disease, such as locomotor ataxia, Bright's disease, or tumour of the brain. Such diseases are sometimes first discovered by the patient having the eyes examined, and, in the case of brain tumours in particular, the appearances found on examination of the eye are almost the most important in the diagnosis; they may be well marked before the patient begins to notice the sight failing. Over-indulgence in tobacco, in alcohol, or in both, may lead to a fogginess of vision usually most marked in the daylight. Hysteria is sometimes responsible for a blindness usually only in one eye, which may last months or even years, but is curable if its nature be recognised.

Colour-blindness is a congenital defect met with in a considerable proportion of people. It is usually only partial, consisting in a loss of perception of, and power to distinguish between, one or two of the fundamental colours (red, green, and blue). It generally affects both eyes, is often hereditary, and is incurable, but the eyes are otherwise normal. Red and green are the colours in which most colour-blind people are defective. A colour-blind person can usually be detected if given a number of different-coloured skeins of wool and asked to match certain picked skeins (a pale green, a pale pink, and a bright red) out of them. Persons who are being examined, however, for railway or steamship work should be required to name and to match colours (especially red and green), as shown through a lantern with coloured glasses, as the results with these are not always the same as with wools. Quite a number of people have minor or even gross colour-blindness, but get through life without ever being aware of the fact; but the results may be disastrous if an engine-driver, for example, has it unawares and undetected.

Half-vision, or *hemianopia,* a condition in which a person only sees things to one or other side, is a condition due always to some disease affecting the optic fibres in the brain.

Errors of Refraction.—*Far-sightedness, long-sightedness,* or *hypermetropia* is easily the commonest error of refraction. It is usually congenital, and often hereditary. Most children are hypermetropic at birth, but as they grow up they become less so, normal-sighted, or even short-sighted. Unless the error is a very considerable one, there is distinct vision for distance. Many hypermetropic patients present no symptoms whatever, especially if young, in good health, and taking plenty of outdoor exercise. In other cases, when near work is indulged in, the symptoms of *eye-strain, weak sight,* or *asthenopia* come on. These show themselves particularly after reading, writing, sewing, and other forms of near work, especially in the evening and with artificial light. There is pain in the eyes and above them, headache sometimes in the brow, sometimes at the back of the head, watering of the eyes, blinking, and a blurred appearance of near objects. Such symptoms are always worse if the patient's health is at all below par. With advancing years there is greater and greater difficulty in reading without correcting glasses. In early childhood hypermetropia often causes squint. The eyes in hypermetropia are predisposed to attacks of conjunctivitis, blepharitis, and glaucoma. The treatment consists in suitable convex glasses, which will make near vision distinct and allow the patient to do near work without fatigue. All cases do not need glasses, only those in which there are symptoms of eye-strain, or where they are required in childhood to correct squint.

Short-sightedness, near-sightedness, or *myopia* is usually an acquired condition which commences in childhood or early youth, when the eyes are used excessively or improperly for near work. It is much commoner in cities than in the country, and it has been very truly said, "the more education the more myopia." Too much study, small or indistinct print, bad light, faulty construction of school-desks, sedentary habits, and poor general health are the conditions which lead to the development of myopia. In most instances it is of low degree, but sometimes it is very extreme, and leads to great impairment of vision, or even blindness. In cases of slight or moderate degree there are practically no symptoms except indistinct vision for far or distant objects; near work can be accomplished easily. In more marked cases distant vision is very indistinct; there may be pain after near use, and the eyes tire very easily. Floating specks in front of the eyes are frequently complained of. Myopic persons will often be noticed to screw the eyelids together and peer out of them when looking at anything distant, or even at such distances as across a room.

Treatment.—For cases of moderate degree concave glasses are required, which will give distinct vision, and these should be worn constantly for both distance and near work. To check any tendency to advance, in young persons especially, near work must be restricted, and reading for too long at a time forbidden. Plenty of exercise and of sleep are necessary. Reading of small print and in a dull light are specially bad. There should be no bending over work, the work being lifted rather to the required distance in front of the eyes, and this should be about 13 inches. In progressive cases, or in those of very high degree, all close work will have to be given up, and operation on the eye may even be necessary.

Astigmatism.—By this is meant that the eye is of different refractive power in different directions. It may be due to changes occurring in the lens, but it is very commonly caused by changes in the cornea following on ulceration, injuries, &c. There is diminution in the sharpness of vision, both distant and near, the amount depending on the degree of astigmatism. There is usually eye-strain or asthenopia, especially on using the eyes for near work, with the same symptoms as are mentioned above under long-sightedness, only they are apt to be even more pronounced and more constantly present. Quite a small amount of astigmatism may give rise to marked symptoms, especially in a young or delicate or nervous person. The treatment consists in getting glasses with a suitable cylindrical curve to correct the defective refraction in the eye or eyes. The two eyes are often unequally affected.

Eye-strain, weak sight, or *asthenopia* is not always due to errors of refraction, although it is specially frequent in hypermetropia and astigmatism, and may also be present in myopia and old-sight. It is sometimes but a symptom of general weakness, and is therefore met with in persons who are hysterical, anæmic, or neurasthenic, and in convalescents from debilitating diseases. The symptoms are pain in the eyes, headache, fatigue and discomfort after using the eyes for any time for near work (especially at night or by artificial light), giddiness, and sometimes nervous affections, such as sick-headache (migraine) or twitchings of the facial muscles. The treatment is: correction of any refractive error which may be present by spectacles; treatment of the general disease, if there be one; rest for the eyes and careful attention to the general habits, such as sleep; and exercise.

Old-sight, or *presbyopia.*—This is a condition which affects all eyes, becoming evident usually about the forty-fifth year. It is due to a loss of elasticity in the lens, and results in interference with the comfort of near vision, so that for reading, sewing, and other forms of near vision the work has to be held farther and farther away from the eyes. If allowed to go on uncorrected, it leads to symptoms of eye-strain. It does not affect distant vision in normal eyes. Near-sighted people are less affected than those with healthy eyes, and far-sighted persons more affected. The treatment consists in getting, for near work only, suitable convex glasses, which will bring the focus of the eye to a comfortable working distance, which is usually about 13 inches, although for some purposes, where the work is at a greater distance (such as reading music), weaker lenses, which only bring it to about 20 inches, will suffice. When the glasses have frequently to be changed for stronger ones, glaucoma should be suspected. (See above.)

Squints are of various kinds, both as regards their causation and treatment. Many are due to some error of refraction in the eyes, and may be put right by wearing suitable glasses; others require an operation performed to shorten one or more of the tendons which move the eyeball, and thus pull the squinting eye straight. Some are of a temporary character, coming on after fevers like diphtheria; while others are due to some disease of the nervous system, and may be incurable. Any child with a squint should have the condition of the eyes investigated early, as the sooner treatment is instituted the better. The discovery of the cause of squints and of the best means of curing them usually requires a considerable amount of patient investigation by the oculist. Double vision often occurs with squint.

Nystagmus is the name given to an involuntary oscillation of the eyes and inability to keep them fixed on any particular object, especially on looking to the side. It is a condition which may be present from infancy, in which case it is incurable, although it may become less marked with advancing years. In other instances it is due to some disease of the nervous system, particularly to disseminated sclerosis, while a special form of it is apt to come on in persons who work in the dark, such as miners. This form generally disappears on giving up mining work, but not otherwise.

Facial Paralysis.—When one side of the face becomes paralysed, there is loss of all the movements representing emotional expression. The skin on the affected side becomes smooth, and the wrinkles disappear. The eye cannot be closed; on attempting to close it the eyeball rolls upwards. The patient cannot whistle, show the teeth, or wrinkle the face, and he smiles with one side of the face only. On chewing, food tends to accumulate between the cheek and the teeth. The mouth has the appearance of being drawn over to the sound side. In cases of old standing, or when recovery does not take place, these appearances become modified, because contractures occur in the paralysed muscles; deep wrinkles form on the paralysed side, and the mouth is drawn to that side. This condition may be very painful, and it is often accompanied by drooping of the lower lid and the escape of tears over the face. The commonest cause of facial paralysis is a neuritis or inflammation of the facial nerve where it comes out of the skull just behind the ear, and this neuritis is very often caused by exposure to cold, such as a draught playing on the side of the head. Rheumatic persons are more prone to get such attacks of neuritis than others. A facial paralysis of this type usually comes on rapidly, but, as a rule, recovery occurs in about a month or six weeks. The treatment usually adopted is to apply a series of blisters behind the ear, and, after about a week from the onset, to have the facial muscles stimulated to contract by the application of galvanic electricity. The blisters can be produced by means of cantharides plaster, a piece about a quarter of an inch square being put on at night; in the morning it is taken off, and the blister pricked and dressed with a little boracic ointment spread on lint. Next night another piece is applied on an adjacent piece of skin, and this should be repeated daily for a week. In rheumatic cases, 10 grains of salicylate of soda should be taken thrice daily after meals, either in powder or in solution. The neuritis is sometimes due to syphilis, in which case it will be necessary for the patient to take iodide of potash (5 to 10 grains, thrice daily after meals, in solution in water).

Facial paralysis may also come on from brain diseases, in which case it is usually accompanied by paralysis of other parts, such as the arm or leg, usually on the same side of the body (see Paralysis); or it may be due to affections of the nerve in its passage through the base of the skull from the brain to the face—*e.g.* it may be due to meningitis, to fractures of the skull, or to middle-ear disease, for the nerve passes very close to the middle ear, and inflammation there sometimes extends into the bone and affects the facial nerve. There are special features of the paralysis due to affections in these various parts, but we need hardly go into a description of these. If a facial paralysis does not show signs of clearing up within a month, advice should certainly be obtained; and it is in most cases advisable to have it at once, because almost in any case instruction will have to be obtained in the use of the battery. In cases where recovery does not occur, the services of a surgeon are now often called in to transplant another nerve on to the affected facial nerve, and thus to regain power over the facial muscles. The nerve usually employed is the nerve to the tongue. The operation results in some atrophy of the corresponding half of the tongue, but this is a much less troublesome condition than paralysis of the face.

Fæces.—Another name for the stools, the character of which sometimes gives a clue to the nature of a disease. (See Stools.)

Fainting.—Fainting, or syncope, is due to a temporary anæmia of the brain. When a person is going to faint there is a feeling of lightness in the head or a sensation of things swimming round one. The face turns very white, and then consciousness is lost, the person falling down limply. The pulse can be felt to be feeble, the person lies still, breathing faintly, and beads of perspiration may appear on the brow. As a rule recovery occurs in a few minutes, but with a period of limpness for some little time afterwards, although at times a person may remain unconscious in a faint for much longer periods, even for hours.

The anæmia of the brain which leads to fainting may be produced in various ways. Sudden standing up may produce faintness or even cause actual fainting, especially if done when the blood is largely on the surface of the body—as, for example, when in a hot bath. This gives us the clue to the method of preventing fainting: when any one feels faint, they should at once sit down and put the head still lower down, between the knees. This ensures a good flow of blood to the brain, and the feeling of faintness passes off. Anæmic persons always faint more readily than those with good blood; this is partly because of the poor quality of the blood, and partly because in them the heart's action is always weak. Weak action of the heart is the commonest cause of fainting. This may be due to actual heart disease, to overstraining of the heart in even a healthy person, or to a very little extra exertion in the case of a person with a heart weakened through illness, especially such illnesses as influenza and diphtheria. Strong sensations or powerful emotions may also lead to a temporary inhibition of the heart's action and cause fainting—*e.g.* sudden bad news, extreme pain, horrid sights, or severe frights. The action on the heart in all these cases is sometimes of such a powerful nature as to cause not merely temporary interference with its action, but complete stoppage and sudden death. Breathing bad air in a confined warm atmosphere is another very common cause of fainting. A person who faints should be kept flat on the back, and, if necessary, taken out into open fresh air. The breathing should be made as easy as possible by loosening anything tight round the neck, and also round the body—tight waistbands and stays, for instance, being undone. Cold cloths should be applied to the face, and smelling-salts, weak ammonia, or burning feathers held under the nose. As soon as the person can swallow, a little alcoholic stimulant may be given, or, better still, a teaspoonful of sal-volatile. Should the faint last long, or should the person be subject to the recurrence of fainting turns, it is advisable to consult a doctor in order to see whether the cause of them cannot be cured.

Falling Sickness.—An old name for epilepsy. (See Epilepsy.)

Farcy.—Another name for glanders. (See Glanders.)

Favus.—The so-called "honeycomb ringworm." (See under Skin Diseases.)

Female Ailments.—See under Labour, Complications of; Menstruation, Disorders of; Pregnancy, Complications of; Women, Diseases peculiar to; also see under Venereal Diseases, especially Gonorrhœa.

Festering.—This term is synonymous with suppuration, the formation of pus or matter. If on an open surface, the result is an ulcer; if below the surface, an abscess. (See Abscess and Ulcer.)

Fever.—As the origin of this term (Latin *ferveo*, "I burn") indicates, the chief symptom of fever is that the patient feels hot and burning, and, if the temperature of the body be taken by means of a thermometer, it will be found to be raised to a greater or less degree above the normal average temperature of the body (98·4° F., or 37° C.). Fever, in the great majority of instances, is due to the action of germs in the body, the poisons or toxins of which so upset the heat-regulating mechanism that the temperature rises. In addition there is always excessive tissue waste, and this greater burning up of tissues is responsible for part of the rise in temperature. Some diseases are so constantly accompanied by a feverish state that they are apt to be thought of as the only fevers (measles, scarlet fever, malaria, typhoid fever, &c.), but practically all inflammations and infections by germs are accompanied by the absorption of poisonous products into the system and resulting fever. Thus a common cold, an abscess, pneumonia, peritonitis, blood-poisoning, and a host of other conditions are all accompanied by fever.

In the earliest stage of a fever the patient often feels cold or chilly, and generally out of sorts; but even at this stage, if the temperature be taken, it will be found to be raised. There is often also rigors or shivering fits, or, in children, sometimes convulsions. This stage is soon followed by the hot stage, when the feverish symptoms are fully developed. The skin is hot and dry, there is usually more or less headache, backache, and aching in the limbs, thirst and dryness of the mouth, and a dirty furred tongue. The appetite is lost, constipation is present (except in fevers like typhoid, cholera, &c.), and the patient is sleepless and sometimes delirious. The rate of the pulse and of the breathing are generally increased, although not equally so in all fevers. The urine is small in quantity, high-coloured, and on standing shows a precipitate of pink urates resulting from the increased tissue waste. In long-continued fevers general wasting of the body occurs. In fever, as in health, the temperature is usually higher in the evening than in the morning. In children a comparatively slight ailment will cause a much greater rise in temperature than would the same condition in an adult, so that high readings of the thermometer in them do not cause so much alarm as in adults. A temperature of about 101° F. is regarded as slight fever, 103° F. to 105° F. as high fever, 106° F. or over as excessive fever or hyperpyrexia. The termination of a fever may be by *crisis*, when the temperature comes down by a sudden drop to normal or below it; this is usually accompanied by profuse sweating and increased flow of urine. When the decline of the fever is slow and gradual, taking perhaps several days to reach normal, the termination is said to be by *lysis*. There are certain well-marked types of fever which require definition. By *continued* fever is meant one in which the temperature remains steadily raised, the daily variation being not more than 2° F. *Remittent* fever is one in which there is a daily fall, with improvement in all the symptoms, but the minimum is never down to normal. *Intermittent* fever is one in which at least once in the twenty-four hours there is a very high temperature, but the lowest temperature is normal or below normal. These last two names are most commonly applied to types of ague or malarial fever. *Hectic* fever, occurring in wasting diseases, especially consumption, shows great swinging in the temperature; it may be either remittent or intermittent. *Relapsing* fever is one in which, after termination by crisis and persistence of a normal temperature for about a week, there is a relapse, with repetition of all the symptoms.

Treatment.—While there are certain special indications for treatment in each different kind of fever, more especially if it be due to some definitely local cause, such as an abscess, there are yet some special features in the treatment more or less common to all fevers, particularly to that group commonly recognised as the infectious fevers, and it will save needless repetition if we consider these in some detail here. The patient should be isolated in as large and airy a room as possible. The room should be kept equably warm at a temperature of about 60° F. to 65° F. A fire is advisable, even in warm weather, not only to warm the room and to cook or heat food, but to burn articles used in the treatment. Fresh air and good ventilation are, however, equally necessary. All unnecessary furniture, &c., should be taken out of the room, particularly anything which would spoil in subsequent disinfection. A sheet hung outside the door, soaked in some disinfectant, is often used; it is not an actual necessity, as spread of infection is sufficiently guarded against in most cases if those in actual attendance on the patient do not mix with the rest of the household or with the outside world, and take the precautions of wearing a washable overall in the sickroom and of thorough cleansing of the hands on leaving it. Soiled clothing should be steeped in some disinfectant, such as 1 in 1000 solution of corrosive sublimate, before being washed at home or sent to the sanitary authorities for disinfection. At the end of the illness the disinfection of the sickroom is best carried out by the sanitary authorities, under the direction of the medical officer of health. The best diet for a feverish patient is a liquid one, given in small quantities and administered frequently, say every two hours. Milk, either plain or slightly diluted with water, will practically never be wrong. From two to four pints can be taken in the twenty-four hours. Whey and albumen water—the latter being made by whipping up the white of an egg in a small tumblerful of cold water —are also always allowable. In chronic cases some variety is required, and the milk may be flavoured with tea, coffee, or cocoa, or a little custard or egg and milk may be given occasionally. (In typhoid special care is necessary, and these remarks on diet do not apply to it.) The patient may be allowed to drink as freely of water as he wishes, and some lemon juice should be given daily with the water. During the febrile stage the patient is seldom hungry, and solid food is not asked for or required until convalescence begins; then the patient's appetite is a good guide. Commencing with custards, arrowroot, and the like, going on to bread and butter, milk puddings, and fish, the ordinary diet can soon be taken again. Beef-teas and meat-soups are not to be given during the febrile stage.

The rise of temperature, especially if it be very high, often requires treatment. It is a good rule to follow that, if the temperature is over 102·5° F., the patient should have cold water applied to the skin in some form or other. It also does good even if the temperature is not so high, but if there is sleeplessness, restlessness, or a very dry skin. The patient may be sponged by being loosely wrapped in a blanket, the trunk and limbs successively exposed and sponged for about five minutes with a sponge partly wrung out of cold water. The water should be at a temperature of 65° F. to 70° F., or colder if the temperature be very high. Another good plan, particularly for cases of hyperpyrexia, is the use of the cold pack. In this, the patient is wrapped in a sheet wrung out of water from 75° F. to 80° F., and put between two blankets. After a quarter to half an hour he is taken out, the skin lightly and quickly dried, and the patient placed between warm blankets. In children, the water used for sponging or packing may advisedly be a little warmer than for adults. Sometimes the patient is wholly immersed in a bath, but this should not be done without a doctor's orders. Drugs are also employed for bringing down the temperature, such as quinine (5 grains of the sulphate of quinine, in powder, every few hours, or half a teaspoonful of the ammoniated tincture) or antifebrin (3 to 5 grains, in powder, every four hours), but their use is not so satisfactory as that of cold water, and they should only be employed if specially ordered. A dose of antipyrin may, however, be taken for headache, if that is severe, but cold applications to the brow will often also relieve a headache. The mouth may be kept clean and sweet by frequent washing out with lemon juice and water. Heart stimulants are often required in fevers, but the selection of the most suitable one, and the time for administration, must be left to the discretion of the doctor. We would only say that the use of alcoholic stimulants should never be commenced too early in the course of a fever as a matter of routine, because, if this is done, they may be found to have lost their efficacy later on, when they are more urgently needed.

Fingers, Affections of.—Abscess in the finger (see Whitlow); contracture of fingers, or bending of fingers into the palm of the hand (see Contracture).

Fissures or cracks are apt to form in such parts as the nipples, the lips, and around the opening of the bowel. For their causes and treatment see under Breast, Diseases of the; Lips, Diseases of the; and Rectum and Anus, Diseases of the.

Fistula.—This is the name applied to any unnatural narrow channel, such, for instance, as may persist when the opening through which an abscess has burst or has been opened to drain does not close, but remains open. Fistulæ may also arise in various other ways, and in a number of different situations about the body, but in all cases some form of surgical treatment is required in order to get them to heal up. One of the commonest forms of fistula is that known as "fistula in ano," in which an abscess forms at the side of the lower end of the bowel (ischio-rectal abscess), bursts above into the bowel, but also opens through the skin below, leaving an unnatural channel which is very difficult to heal. (See Rectum and Anus, Diseases of the.)

Fits.—A vague term used for any form of sudden seizure, whether of a convulsive nature or not. (See under Apoplexy, Convulsions, Epilepsy, Fainting, and Hysteria.)

Flat-foot.—See under Deformities.

Flatulence.—The presence of gas in the stomach and intestines. That present in the stomach escapes as eructations, that in the intestine as wind from the rectum. A small amount is always present even in health, but, if excessive, it is generally associated with symptoms of indigestion. For treatment see under DYSPEPSIA.

Flea-bites.—See under PARASITES.

Floating Kidney.—See KIDNEYS, DISEASES OF THE.

Flooding is the name popularly applied to excessive discharge of blood from the womb. It may be due to disturbed menstruation, and recur every month or oftener, but in many cases it is the sign of a miscarriage or abortion. (See ABORTION, and MENSTRUATION, DISORDERS OF; also LABOUR, COMPLICATIONS OF.)

Flushings.—A term used to signify the peculiar sensations often experienced by women for a considerable time at or about the climacteric, or change of life. (See section of the book dealing with PREGNANCY AND MOTHERHOOD

Foot-drop.—See under DROP-WRIST.

Foot-and-mouth Disease.—An acute infectious disease of herbivorous animals, sometimes causing large epidemics amongst cattle. The disease is occasionally, though rarely, communicated to children or adults through the medium of milk from diseased cows, or through butter or cheese made from such milk. The symptoms in human patients are those of fever and acute inflammation of the mouth. Recovery usually occurs, although cases are sometimes fatal. The treatment is that for fever generally, and for inflammation of the mouth. (See MOUTH, DISEASES OF THE.)

Frambœsia.—See YAWS.

Freckles.—See under SKIN DISEASES.

Fungus-foot.—See MADURA FOOT.

Gait, Disturbances of.—Alterations in the manner of walking occur in a considerable number of diseases, and the character of the gait is not infrequently a useful guide in the diagnosis, particularly in diseases of the nervous system, some of which give rise to very characteristic modes of progression when the patient walks.

A *limping* or *hobbling* gait may be due to any painful or disabling affection of one or of both lower extremities, such as corns, rheumatism, gout, sciatica, acute or chronic disease of either the hip- or knee-joint, sprains, or paralysis of one leg, such as may arise from infantile paralysis and result in deformities such as club-foot.

In flat-foot the person walks with the toes turned very much outwards—"splay-footed"—so that the feet are about at right angles to each other.

In pregnancy, obesity, ascites, large abdominal tumours, and the disease known as pseudo-hypertrophic paralysis, *the body leans backwards* and the *feet are kept widely separated* while walking.

In *locomotor ataxia* the feet are raised suddenly and too high, swung forward with unnecessary force, and brought down again with a flop to the ground, heels first.

A *reeling gait* like that of an intoxicated person is characteristic of diseases of the brain affecting the cerebellum. The movements are staggering, reeling, and swaying, and any given point is reached in a zig-zag fashion.

A "heather-step" or "steppage" gait, in which the knee is bent and the foot lifted high, is seen when there is foot-drop, which in its turn is due to *neuritis* of the nerves of the leg, very often alcoholic in origin, but sometimes due to other conditions which produce neuritis.

In *spastic paralysis* the legs are rigid, move stiffly and with jerks, the feet are dragged or swung round in a circle to avoid the toes catching on the ground. Sometimes the knees touch and cannot be separated, then the legs cross at each step, giving rise to a sort of "scissors" gait. In paralysis of one side of the body, following an attack of *apoplexy*, one leg is spastic or stiff, one foot being dragged, swung out and round to the front, the toes often scraping the ground.

In *shaking palsy* or *paralysis agitans* the body is bent forwards, and the patient takes short, shuffling, hurried steps, his speed tending to increase, looking exactly as if he were being pushed forward and was trying to prevent it.

A *waddling gait* is seen in pseudo-hypertrophic paralysis and in congenital dislocation of the hip-joint.

A *tottering gait* may simply be due to the weakness of old age, but it may appear prematurely in some nervous diseases.

Children, as a rule, learn to walk between the ages of twelve and eighteen months. If they do not, they should be carefully examined to see whether they are not mentally deficient, or the subjects of rickets or of infantile paralysis.

Gall-bladder and Ducts, Diseases of the.—*Catarrh. Acute catarrh* of the bile passages occurs in many fevers; it is commonly also a result of any indiscretion in diet, the catarrh spreading from the stomach and upper part of the intestine; and it follows the expulsion of a gall-stone. The symptoms are (in addition, perhaps, to those of acute gastric catarrh, for which see under STOMACH DISEASES) pain and tenderness under the edge of the ribs on the right side, and, after a day or so, jaundice. As this is the feature which is likely to most attract the patient's attention, the further account of the symptoms and treatment are described under JAUNDICE.

Chronic catarrh, with rather indefinite "bilious attacks," muddy complexion, and feelings of discomfort in the same region as in acute catarrh, is exceedingly likely to lead to the formation of gall-stones, and the symptoms, prevention, and cure are the same as those of gall-stones. (See below.)

Gall-stones.—The symptoms of gall-stones are very variable. In the first place it must be mentioned that they may be present in the gall-bladder for years without giving rise to any trouble. Frequently, however, their occurrence is preceded by years of dyspepsia and constipation, especially in women (in whom they are much commoner than in men), in persons who lead sedentary lives, and in those who eat largely of carbohydrate (starchy and sugary) foods. Occasional vague pains and discomfort over the region of the gall-bladder (just below the ribs on the right side) will probably also be complained of. A swelling may even become visible or palpable in this region. One of the most striking, and perhaps the commonest, way in which their presence becomes known is by an attack of *biliary colic*. This is due to a gall-stone passing from the gall-bladder into the duct along with the bile. It causes pain of a most acute character, doubling the patient up; the pain radiates from the right side, shooting through to the back in the region of the right shoulder-blade; it commences abruptly, and continues in paroxysms, accompanied by vomiting and profuse cold sweating, until the stone is either discharged into the bowel (whence it is voided later in the stools) or slips back into the gall-bladder. This leads to cessation of the pain, although aching and tenderness persist for some time, and the attack is usually followed by a little jaundice. These attacks may recur repeatedly, but in a somewhat milder form, if, instead of one or two large stones, there have been a number of small stones in the gall-bladder. After getting into the bile-duct a stone may stick or become impacted; in this case the pain will gradually die down and disappear, but, as bile cannot get past the block, the gall-bladder gets hugely distended, forming an obvious swelling, and the patient becomes more and more deeply jaundiced, passing through all degrees of yellow and green, until he may become almost black.

Another result of gall-stones may be an attack of acute inflammation or suppuration in the gall-bladder, organisms finding their way up into it from the bowel. This will be evidenced by acute pain in the region of the gall-bladder, vomiting, shivering fits, and high fever, which will distinguish inflammation from biliary colic, in which the temperature may be a little raised, but not more than about 102° F. Such a complication is a serious one, owing to the risk of perforation and general peritonitis, although it may quieten down and become chronic.

Treatment.—The causes which lead to the formation of gall-stones are not very exactly known, but, generally speaking, they are unlikely to form in persons who lead (to use a phrase much in evidence at the present day) the simple life—*i.e.* who eat moderately of plain, simple food, take a reasonable amount of exercise (open-air preferably, riding being the best of all), and are careful not to allow the bowels to become constipated.

An attack of biliary colic may be treated by taking a hot bath, if the patient is able to move sufficiently to get into one; if not, then poultices or hot fomentations should be applied over the region of the gall-bladder, and draughts of warm water drunk, even though it may be repeatedly vomited. A doctor must be sent for, as the pain is often so intense as to require large doses of morphia, or even the administration of chloroform; while, if such complications as impaction of a stone or acute inflammation occur, surgical measures will be required. When, through the occurrence of an attack of biliary colic or otherwise, a person becomes aware of the presence of gall-stones, measures must be taken to try to get rid of them, or, at all events, to prevent more forming. There are many substances—such, for instance, as olive oil—which will dissolve stones outside the body, but there is very little use in consuming large quantities of these, as is sometimes done, in the hope that the stones in the gall-bladder will be dissolved, because they do not reach the stones *in situ.* The best plan seems to be to encourage a free flow of bile by exercise, gentle massage or rubbing over the gall-bladder, avoidance of tight corsets or anything tight round the waist, plain diet, and the administration of phosphate of soda, which can be taken in teaspoonful doses thrice daily, either dissolved in water or taken like salt along with meals. This should prevent constipation; but, if any further purgatives are necessary, an occasional 1-grain dose of calomel at night may be taken. Plenty of water should be drunk, but alcoholic liquors are better avoided. Practically all forms of purgative mineral waters are useful, but in particular such waters as Carlsbad or Vichy, of which half a tumblerful may be taken warm first thing every morning. A course at either of these spas is an excellent thing for those who can manage it. In strong and otherwise healthy persons, if such measures do not get rid of the symptoms, it is very advisable to consult a medical man as to the advisability of having the gall-stones removed by operation, which is comparatively easily done. The risks of leaving them are: (1) that severe biliary colic, with perhaps impaction of a stone necessitating operation under much less favourable circumstances, may occur at any time; (2) that suppuration may come on at any time in the gall-bladder; (3) that cancer may follow later from the irritation of the stones.

Suppuration in the Gall-bladder.—This is characterised by the presence of shivering fits, high fever, vomiting, often delirium, and acute pain and tenderness in the region of the gall-bladder. It may occasionally come on after a common catarrh of the gall-bladder, more often after some infective fever such as typhoid, and, as mentioned above, from the presence of gall-stones. Operative treatment is necessary, the gall-bladder having to be opened and drained.

Cancer.—This is found not infrequently associated with gall-stones, and is probably due to their irritation. Cancer starting in the gall-bladder or bile-ducts primarily is not, however, common. It always affects the liver soon after its commencement, and the symptoms are not essentially different from those of cancer of the liver, jaundice being usually a prominent feature. The condition is a very hopeless one, as it is practically never possible to remove the growth. (See JAUNDICE, and LIVER, DISEASES OF THE—CANCER.)

Ganglion.—This is the name applied to cyst-like swellings seen most commonly at the back of the wrist, less commonly on the front of the wrist or on the foot. They are rounded, firm, elastic swellings, which form in connection with the sheaths of tendons, and contain a material like apple-jelly in appearance. They are neither painful nor tender, but may give rise to a feeling of weakness in the wrist as they increase in size, besides being rather unsightly. Usually only one is present.

Painting with iodine will sometimes cause them to disappear. Tincture of iodine may be painted on every night for a few weeks, giving one night's rest every fourth or fifth night, however, when vaseline should be applied, so as to prevent the skin from cracking. If this does not succeed, the ganglion may be ruptured by firm pressure with fingers or a blow with the flat of a book. To prevent the ganglion filling up again, firm pressure must then be applied for a week or so. This can best be done by a tight bandage with a pad, such as a coin wrapped in a handkerchief, over the site of the ruptured swelling. Should this still fail, there is nothing left but to have the sac removed or closed by a little operation.

Gangrene, or **Mortification,** means the loss of vitality or death of a considerable area of tissue, usually of a limb. A part gone or becoming gangrenous changes colour, becoming either waxy-looking, or, in the more serious class of cases, yellow, green, purple, or black. No pulsation can be felt in the arteries of a gangrenous part; it turns cold, and all sensation in it is lost, although there may be much pain just while the part is dying. There are two forms of gangrene:

(*a*) Dry gangrene, in which the dead part shrivels up, mummifies, and becomes hard, dry, and wrinkled, and of a dark-brown colour. The line of demarcation between the dead and the living tissue is generally quite sharp and well defined, being marked off by a red ring of inflammation on the healthy side. This red ring gradually deepens, until, after perhaps a month or two, it cuts off the gangrenous part entirely, leaving a stump. The toes, the foot, or the foot and part of the leg, are the parts most often affected. This form of gangrene may occur in old people with degenerated arteries and bad circulation; in persons with diabetes; in cases where, as the result of accident, the main blood-vessels to the limb have been torn or cut and the circulation cannot be kept up; or as a result of the spasm in the blood-vessels which occurs in chronic ergot poisoning and in Raynaud's disease. (See these conditions.) Frost-bite, also, may result in dry gangrene if it has been severe. The treatment of dry gangrene consists, in the first instance, of measures to prevent the part from undergoing putrefaction—*i.e.* from changing into wet or moist gangrene. The part should be gently but thoroughly scrubbed with 1 in 20 carbolic lotion, and then wrapped up in sterilised gauze or wool. When the line of demarcation of the living from the dead tissues has distinctly formed, amputation is usually performed fairly closely above this line.

(*b*) Moist gangrene is associated with the presence of certain special germs in the tissues, and the gangrene may be of this type from the outset, or a dry gangrene may become infected and moist. It is a very serious condition. The part becomes swollen, greatly discoloured, covered with blebs containing fluid, which oozes out abundantly, and is very foul-smelling. The patient is usually in a condition of high fever, and often delirious, and death may result from general blood-poisoning in a few days. There is no sharply-defined margin of the gangrenous area. The only treatment which holds out any hope is early amputation well above the site of the gangrenous part.

Gastralgia means pain in the stomach. It is often of a cramping character, and referred to as "cramp in the stomach." (See under Stomach.)

Gastric Catarrh, Ulcer; Gastritis.—See under Stomach, Diseases of the, and under Dyspepsia, for chronic gastritis.

Gastric Fever.—An old name for typhoid fever. (See Typhoid Fever.)

General Paralysis.—A special form of insanity. (See under Insanity.)

German Measles (or **Rötheln**).—An infectious fever with a rash, which is a sort of intermediate in character between that of ordinary measles and that of scarlet fever. The disease, however, is not a hybrid between these two diseases, but is perfectly distinct. Previous attacks of measles or of scarlet fever give no protection against it, nor does an attack of it give any protection against them.

The disease commences with headache, pains in the back and legs and general discomfort, cold in the head, sore throat, and rise of temperature. After from one to three days the rash appears, coming out first on the face and neck in the shape of pink, slightly-raised spots. It then spreads over the whole body, but may have faded from the face before it comes out elsewhere. The spots often run together into a general redness on the face, but elsewhere they generally remain as distinct, separate patches. About the time the rash comes out, or sometimes a little earlier, the glands at the side of the neck can be felt to be enlarged, feeling like small nuts under the skin. The rash fades after three or four days, and the temperature, which seldom reaches higher than 102° F., falls by crisis—*i.e.* suddenly—and during the stage of convalescence fine bran-like scales separate from the skin.

The disease is usually a mild one, seldom with any serious complications, and often so mild that the patient scarcely feels ill at all. It is usually an affection of childhood, and commonly occurs in epidemics in the springtime. The infection is only spread by close personal contact from person to person.

The only treatment required is to isolate the patient from other children, keep him in bed during the feverish stage, and on light diet. (See under Fever.) The child may be considered as not infectious when the scales have all separated, which is usually about ten days after the disappearance of the rash. The incubation period of the disease is sometimes rather a long one, and therefore the period of quarantine—*i.e.* the period after possible exposure to infection until the time when one can definitely say that the person is not going to catch the disease—must be equally long, namely, three weeks.

Giddiness.—See Vertigo.

Glanders.—This is a disease met with principally in horses, but it occurs occasionally in man, especially in persons who have much to do with horses. In the horse it appears as nodular masses in the nostrils, this being called *glanders*. When these nodules appear under the skin about the body or limbs, it is called *farcy*, but these two conditions are really one and the same disease, due to a special bacillus. Similar types appear in man.

When the bacillus gets into a man, the symptoms begin acutely, about four days after infection, with general wretchedness, some fever, and the appearance, at the site of inoculation (usually a scratch or prick), of a red swelling. This breaks down in a few days, and discharges; then, over more or less the whole of the body, red spots appear, which rapidly develop into pustules—*i.e.* raised blisters, about the size of a pea, containing turbid fluid or pus. They look very like the pustules which come out in smallpox. Pneumonia often comes on, and the disease is generally fatal in about ten days. If the nose has been the site of infection, there will be ulceration inside the nose, and the discharge of abundant pus from the nostrils. If the infection has been through the skin—*i.e.* "farcy"—the lymphatics near the infected part become swollen and tender, and fresh nodules soon appear on them—the so-called farcy-buds—which break down and form discharging sores like the original one. The nose usually escapes in this form, but the same rash may appear all over the body, and an equally rapid fatal issue occur. Sometimes more chronic forms occur, presenting a picture of chronic abscesses, but always with more or less blood-poisoning, from which death will ultimately occur. It is rare for complete recovery to take place.

The treatment consists in keeping up the patient's strength as much as possible with strong, nourishing soups, and stimulants are generally given. The swellings require to be treated like any abscess as they form—*i.e.* opening and draining. There is also a special remedy made from growths of the bacillus which causes the disease; this should always be given a thorough trial, as it is the most hopeful mode of treatment, but even withal the disease is only too frequently fatal. We need hardly say that a doctor should be in attendance.

When an outbreak occurs in horses, it is of the utmost importance to prevent further spread by immediate destruction of the infected animals and thorough disinfection of the infected stables.

Glands, Diseases of.—In this connection we will only refer to affections of the lymphatic glands which are scattered about the body in connection with the network of lymphatic vessels, not to diseases of such organs as the liver, kidneys, &c., which are also glands; nor of such glands as the sweat glands of the skin, the salivary glands, the thyroid gland, &c. The affections of these will be found described either under the heading of the particular organ affected or disease produced.

Tubercular Glands, or Scrofula.—This is the condition generally present when a person is spoken of as having "glands in the neck." Children and young adults are chiefly affected, the first manifestation being the appearance of swellings in the side of the neck and under the jaw, these swellings being enlarged glands. Their growth is slow and usually painless. If left untreated, the enlargement may become very prominent, and the glands, which at first are freely movable under the skin, become matted together and fixed in position. Sooner or later they are certain to break down suppuration occurs in them, and a typical "cold abscess" forms. (See ABSCESS, CHRONIC OR COLD.) This, if left to itself, will burst through the skin in one or more places, and may go on discharging for a long period, and, even when they do heal, leave ugly, red, depressed, puckered scars. Sometimes the formation of an abscess may occur more early in the course, before very great enlargement has taken place. The same class of person is likely to be affected as is liable to develop consumption, for the diseases are one and the same, differing only in the part of the body involved. Those of consumptive families, and those whose surroundings are unhealthy or whose strength is weakened by poor food or bad air, are therefore most likely to suffer from "glands in the neck." The infection by the tubercle bacillus takes place through decayed teeth, adenoids, enlarged tonsils, or occasionally through running ears, or the eczematous condition which may follow the presence of lice on the head. Other glands than those in the neck may also become affected by tuberculosis, one of the most serious forms being that in which the glands in the mesentery, or attachment of the bowel to the abdominal wall, become affected. The symptoms resemble tuberculosis of the intestines or tubercular peritonitis. (See these conditions.)

Treatment.—In the earliest stages the progress of the condition can sometimes be stayed by treatment directed towards strengthening the constitution. Children should be taken from school and sent to the country, preferably at the seaside, and should live in the open air as much as possible. The diet should be a good one, much the same as that recommended for consumption, including plenty of milk, and such tonics as cod-liver oil emulsion and malt extract. The only local treatment advised without consultation with a doctor is that the throat, as the most likely source of infection, should be gargled twice or thrice daily with a teaspoonful of peroxide of hydrogen in a wineglassful of water. (*N.B.*—This will froth in the mouth.) Should the glands continue to enlarge, however, or should they show any signs of becoming matted together or of softening, then the sooner they are removed by operation the better. The removal can be done much more easily and with less mark if it be done before matting or suppuration has occurred. Complete removal of the diseased glands is much to be desired, because it means otherwise that a tubercular focus is left in the body, which at any time may light up and start an acute form of consumption or tuberculosis of some other part.

Acute inflammation of glands, in which the glands become somewhat enlarged, painful, and tender, and may go on to suppuration and abscess formation, and from which the patient will be feverish, is a fairly common condition, sometimes primary in the glands, but usually secondary to a wound or other source of infection. As an example of a primary inflammation in glands may be mentioned bubonic plague (see PLAGUE), and occasionally a strain or invisible scratch in the skin may account for acute inflammations in glands without any obvious cause. Usually, however, some obvious source of infection is to be found: thus, in the case of a wound in the hand the infection or poison formed in the wound spreads up the lymphatics, and sets up acute inflammation in the glands in the armpit; in the case of the foot, in the groin. Sore throats, running ears, or eczemas of the head are apt to be followed by acute inflammation in the glands of the neck, &c.

The treatment consists, in the first place, of attention to the primary source of infection, the wound, abscess, or whatever it is requiring cleaning, dressing, opening, &c. The inflamed gland should be treated as a threatening acute abscess—*i.e.* the patient should lie up and have a poultice, or, better, a hot fomentation (for that cleanses the skin should subsequent opening be necessary) applied. This may be kept in position by a flannel bandage, which also helps to keep the part quiet and at rest, which is advisable. If the swelling becomes soft and the skin over it red, that indicates the formation of pus and the formation of an abscess. (For further details in treatment see under ABSCESS; for the treatment of plague, see PLAGUE.)

Venereal diseases cause enlargement of the glands in the groin and elsewhere. In syphilis, within about six weeks of acquiring the infection, the glands of the groin become slightly enlarged, feeling like large shot which can be rolled about under the skin. They are usually quite painless. In gonorrhœa sometimes an acute abscess forms in the groin glands. (See VENEREAL DISEASES—*Syphilis* and *Gonorrhœa.*)

Other diseases causing enlargement of lymphatic glands, sometimes of enormous extent, and affecting possibly all the groups of glands in the body, including those internally in the chest and abdomen as well as those in the neck, armpit, and groin, are leucocythæmia, a disease of the blood (see under BLOOD, DISEASES OF THE); lymphadenoma, or Hodgkin's disease; and lymphosarcoma, a form of tumour commencing in the glands. These conditions are not always easily distinguished the one from the other, nor yet from tubercular disease of the glands, and as they all may affect young people, we can only say that any person in whom enlargement of the glands appears, whether with or without any other symptoms, should without delay obtain medical advice.

Cancer in any situation is almost invariably followed sooner or later by growths in lymphatic glands. The great aim in the treatment of cancer is to get the primary growth removed completely before these secondary growths have occurred, because, when the lymphatic glands have become involved, it becomes in most cases impossible to get rid of the disease entirely, so that, even if the primary tumour be removed, recurrence is extremely likely to occur from the secondary growths in the glands.

Glaucoma.—See under EYE, DISEASES OF THE.

Gleet.—A chronic discharge from the pipe or urethra. It is always due to a previous attack of gonorrhœa, and must be regarded as a chronic form of gonorrhœa. (See VENEREAL DISEASES—*Gonorrhœa.*)

Gnat Fever.—See THREE-DAYS' FEVER.

Goitre.—This is the term applied to swellings in the thyroid gland, which lies in front of the windpipe in the neck. Two perfectly distinct forms occur—viz. simple goitre, and exophthalmic goitre, in which there is also marked prominence of the eyes and other symptoms. We shall first consider *simple goitre.* This disease is endemic or constantly present in certain restricted areas in many parts of the world. The localities affected are almost entirely narrow valleys in mountainous regions such as Derbyshire (whence it gets the local name in England of "Derbyshire neck"), parts of the south of Scotland, the Black Forest in Germany, and, above all, parts of Switzerland, and in the Himalayas. In these same regions cretins are often met with. Both men and women become affected in these localities, and persons going to a goitrous district may likewise develop the disease. Sporadic cases—*i.e.* odd cases occurring in any locality—are also known, but in this instance it is practically only women who become affected. The first appearance of the enlargement usually occurs in the later years of childhood, and the growth of the swelling is slow, extending over years. Sometimes it is all on one side of the neck, but usually on both, although one may be larger than the other. The growth is unaccompanied by pain, or, indeed, by any symptoms, in most cases. It may, however, become so large as to press on the windpipe or gullet, and give rise to difficulty in breathing or swallowing, and, from its size alone, may give rise to considerable inconvenience. In late stages of goitre the patient may develop symptoms of myxœdema. (See MYXŒDEMA.) The cause of the disease is not yet certain—whether it be due to the lack of sunshine in the long winter months, some peculiar character of the limestone or glacier water, or some parasite in the water. The first step in the treatment should be, if possible, to remove the person from the goitrous area; in many milder cases this is all that is required for a cure. A plan which is used in India, and often with conspicuous success, is to smear the gland daily with red iodide of mercury ointment, and then to make the patient sit out in the sun for several hours, with the goitre fully exposed to the sun's rays. If sunshine cannot be obtained, the ointment may be well rubbed into the goitre, and this may be found as satisfactory. Should there be evidence that the gland is diseased in addition to the enlargement, as evidenced by the patient becoming dull and lethargic—*i.e.* developing symptoms of cretinism or myxœdema—then thyroid gland substance will have to be administered; but this should only be done under medical supervision at first, until the dosage suitable for the particular case has been ascertained. If the patient cannot leave the district, then care should be taken that all the water drunk should be boiled before being taken, as this seems to destroy its obnoxious characters. Where the swelling is very large or giving rise to trouble by pressure on surrounding structures, it becomes necessary to have it removed by operation.

Exophthalmic Goitre.—In this disease the goitre is but one of several symptoms, and by no means the most prominent or important. The other leading features are exophthalmos or prominence of the eyes, nervousness and tremulousness, and rapid action of the heart. This condition is much commoner in women than in men; it is more likely to occur in those of a nervous stock, and very often comes on after some worry or shock, although sometimes no such exciting cause can be traced. As a rule it comes on gradually and insidiously, but occasionally it develops with great rapidity, in one or two days. These acute cases are often accompanied by delirium.

The rapid heart action is usually one of the first symptoms to appear; it may be as rapid as 200 per minute, but varies greatly. Any emotion or excitement makes it much worse. Palpitation is very distressing, and there may be great throbbing in the arteries, visible especially in the neck. The skin readily flushes with any excitement or exertion, and perspiration is often excessive. The prominence of the eyes appears soon after the rapid heart's action. Both eyes usually bulge, but one sometimes distinctly more than the other. The prominence leads to much more of the whites of the eyes being visible than normally, and it is noticeable that the winking movements of the lids occur less frequently than in healthy persons. The goitre never attains anything like the size which a simple goitre may reach; often the enlargement is not more than just enough to be noticeable, and to cause the patient to feel the neckband tight. One side is often rather more enlarged than the other; the whole gland may pulsate and, on putting the hand on it a thrill, like the feeling of a cat purring, may be felt. The patients are always very easily excited and made nervous; when lying quiet there may be no tremor, but on the least excitement it will become visible, especially in the hands, which will shake rapidly with a fine, tremulous motion. Attacks of vomiting and of diarrhœa for no apparent reason are another common, although not constant, feature of this disease. In this condition we have to deal with an over-action of the thyroid gland, it being the exact antithesis of myxœdema, which is due to under-action of that small but important structure.

Treatment.—It may be said that the general tendency of cases of exophthalmic goitre is towards improvement and ultimate cure, but the process may be slow and extend over years. Medical advice should always be obtained; in cases of any severity complete rest in bed is necessary, and freedom from all excitement, the confinement to bed lasting for several weeks, more or less according to the improvement made. In less severe or improving cases the patient need not be kept constantly in bed, but should rest a good deal and not indulge in any heavy exercise or even mental work, and social excitements must be interdicted. A quiet life in the country, spending much of the time out of doors, is very suitable. The diet while in bed is generally a strictly milk one; when up, some solid food is required, but the meals should never be heavy, and should be of light, plain, easily-digested articles. Of medicines many have been tried, but no one can be said to be anything like certain in its results, and we do not consider it advisable to recommend any particular one to be taken without medical supervision. Electrical treatment has been found satisfactory in a number of instances, but even this cannot be said to be curative, or even certain of producing improvement. If improvement of distinct degree does not follow some months of such a regimen as is here indicated, the question of operation—*i.e.* of removal of part of the over-functionating gland, so as to leave just about what corresponds to the normal gland in size—may be seriously considered. Operation cannot be lightly undertaken in this disease, however, because, although brilliant success often follows it, particularly when done in not very bad cases, on the other hand patients with exophthalmic goitre stand operation very badly, and a number of cases have died after operation. Against this is to be placed the fact that the prospects of a successful operation are very much better when undertaken early than when it is done as a last resort in cases getting worse instead of improving. Circumstances and the patient's wishes will have to settle what is to be done in each particular case.

Gonorrhœa.—See under Venereal Diseases.

Gout.—This is a disease with many manifestations. It often takes an acute form in the shape of an acute inflammatory attack in the great toe; in chronic gout there is more long-lasting, but less severe, swelling in various joints, and deposition of the so-called chalk-stones under the skin. Gout may also be "suppressed," which is the term applied to the vomiting, diarrhœa, and breathlessness which may occur coincident with the disappearance of pain from the joints; and in all gouty families and gouty persons there are apt to be symptoms of various kinds, which, although not obviously gouty, will not usually disappear unless the patient is treated for gout—to these the term "irregular gout" is sometimes applied. These will be mentioned in greater detail later.

Gout is associated with an excess of uric acid in the system, and the deposition of this in the shape of crystals of urate of soda in the joints and other structures, this deposition being accompanied by pain. There is a strong hereditary predisposition to gout, and in gouty families the dangerous period is reached about middle life. In about half of all cases a definite family history of gout can be obtained, but probably more important than the heredity is the habits of the individual. Over-indulgence in alcohol, particularly if it be taken in the form of heavy ales or sweet wines, is responsible for many cases. Over-eating, especially of rich animal foods, is another cause, more especially if it be combined with too little exercise. It must be remembered, however, that gout also occurs in persons who are temperate in every way as regards food and drink; in them, mental or physical over-work of long standing seems to be responsible. Although the faulty chemistry which causes the excess of uric acid in the system is not yet clearly understood—witness the many theories which there are to account for it—it seems probable that, in many cases, at all events, it is not due to excessive formation of uric acid, but to defective excretion of it, and that the kidneys, the excretory organs, are at fault. One agent which so affects the kidneys as to render them deficient in the power to excrete uric acid is lead, and a certain number of cases of chronic gout, especially amongst workers in lead, is definitely due to chronic lead-poisoning. (See Lead-poisoning.) Gout is much commoner in men than in women, and is most frequent between the ages of thirty and fifty, although no age is altogether exempt from its attacks. Those who lead luxurious lives are most affected, but the labouring classes are not altogether spared by it. The disease sometimes called "poor man's gout" is, however, not gout at all, but rheumatoid arthritis or rheumatic gout, which is a totally different disease.

Symptoms.—1. *Acute Gout.* After a period of feeling out of sorts and irritable the patient is seized, usually at night, with excruciating pain in the joint at the base of the great toe. Very rarely some other joint is the affected one. The joint swells rapidly, the skin over it becoming red, tense, and shiny, with the veins distended and prominent. The patient is feverish, the temperature reaching perhaps 102° F., dyspeptic, and passes very high-coloured urine. Towards morning the attack usually wears off considerably, but a return may be expected confidently the following night, and perhaps for several nights, though in a less aggravated form. Such an attack may occur once in a lifetime, once a year, or frequently. Immediately after an attack the patient generally feels remarkably well, but repeated attacks will pull one down, and render one's life both miserable and a nuisance to others.

2. *Chronic Gout.*—In this the attacks are of a similar nature, but less severe, although more long-lasting, and many joints of the body become

affected. Deposition of urates goes on in the cartilages, sinews, and ligaments around the joints, leading to considerable swelling and permanent deformity. The joints of the hands and feet suffer most, but the elbows and knees are often affected also. Deposition of the urate of soda also takes place in the skin, forming the structures known as tophi, or chalk-stones. When these occur about the knuckles, they often burst through the skin, and the patient may then, if he so desires, write on a slate with his knuckles. Another situation where they are often seen is the ear. The subjects of chronic gout are usually confirmed dyspeptics, and generally, to say the least of it, trying in the temper.

3. *Suppressed gout* means the appearance of such symptoms as vomiting, diarrhœa, or breathlessness, with irregular action of the heart, coincident with the disappearance of the pain of an attack of acute gout. It is the most serious form of gout; sometimes it is due to injudicious treatment, driving the gout, as it were, inwards.

4. *Irregular gout* means those various symptoms which may occur as complications of definite gout in joints, or appear in persons of gouty constitution without the appearance of definite gout in the joints at all. Such manifestations may require special treatment, such as is described under their own headings, but freedom from them will seldom be attained unless their gouty nature is realised, and the patient put on a regimen such as is described below as that suitable for the gouty constitution. The principal symptoms which may crop up as irregular gout are as follows: on the skin eczema is very common, also acne rosacea, in which the face, and especially the nose, becomes lumpy, red, and with prominent dark-coloured minute veins (see ECZEMA, and under NOSE DISEASES); bronchitis and asthma are prevalent, alternating attacks of typical gout, eczema, and asthma being not infrequent in some patients; attacks of biliousness and of palpitation; cystitis (inflammation of the bladder); uric acid stones in the bladder, or the frequent passage of gravel; headaches, neuralgia, and, in the eye, iritis and glaucoma.

Treatment.—1. *For Acute Attacks.* The patient should remain in bed or on a couch, with the leg supported on a pillow level with, or a little higher than, the body. The foot should be well wrapped up in cotton-wool, or, better, cotton-wool soaked in hot water containing a little carbonate of soda and some 20 or 30 drops of laudanum, and then covered over lightly with oiled silk. This soothing fomentation should be changed every four hours. At the commencement of the attack the patient should take a dose of calomel or blue pill (3 or 4 grains), followed in the morning by a Seidlitz power or a tablespoonful of Epsom salts in a half-tumblerful of water. The best drug to take then, provided that the heart is sound, is colchicum. At the commencement a fairly large dose, say half a teaspoonful of colchicum wine, may be taken in a little water; later, 15 drops may be taken thrice daily. The patient should drink freely of lithia water, or of water containing effervescent citrate of potash. The diet during the acute stage, while the pain and swelling are present, should be of the simplest; milk alone, or milk, bread and milk, tea made with milk, and thin dry toast. No alcohol, and no beef-tea or meat essences, must be taken.

2. *Regimen suitable between Attacks, or for a Person with Gouty Constitution and Tendencies.*—The diet must be a moderate one, both as regards quality and quantity. Big meals must be avoided, and all rich made-up dishes, sugar, pastry, and sweet fruits shunned. Some authorities advise that no meat should be taken at all, but all are agreed that it must be partaken of, at all events, in great moderation, and never more than once a day. The least harmful forms are fish and poultry, but even rich fish—such as salmon, mackerel, smoked fish and shellfish, lobster, &c.—and duck, pigeon, and high game must be interdicted. Meat soups or essences, kidney, sweetbreads, sausages, cured meats, and pickled foods must also be abjured, but plain butcher meat may, as a rule, be partaken of safely once a day. Green vegetables and stewed fruits may be taken freely, potatoes moderately, but tomatoes, beetroot, rhubarb, and mushrooms should not be taken. Cheese free from mould is allowable in small amount. With regard to liquors, it may be said briefly that alcoholic liquors are far better not to be taken at all. If the patient insist on having something, or if it be necessary for other reasons, then the least harmful form is undoubtedly a little whisky well diluted. Dry cider, and wines free from sugar, such as Berncastler, are also fairly innocuous; the most harmful forms are port, burgundy, champagne (especially if sweet), and heavy ales or beers. Even tea and coffee must be taken weak. It is a very good plan to form the habit of sipping slowly, while dressing in the morning and undressing at night, from half to one tumblerful of water, hot if desired, and flavoured with a slice of lemon. Many alkaline mineral waters do good, probably more from the flushing out of the system than from any special ingredient of the water, and occasional visits to a spa, either at home or abroad, is to be recommended, not merely for the drinking of the waters, but for the regulated diet, exercise, and freedom from home and business cares and worries. Hot-air baths and massage are often useful for stiff, gouty joints; and for the itchiness of the skin which is so frequently complained of, washing with a little 1 in 60 carbolic lotion is to be recommended.

Grand Mal.—See EPILEPSY.

Gravel.—The name applied to any sandy or gravelly-looking deposit which may be present in the urine on passing, or be thrown down on standing. Usually the grains are composed of uric acid, and are of a reddish colour. The condition is very common in persons of gouty tendencies. So long as the precipitation only occurs in the urine after it has been passed, it matters little, but when the formation of gravel takes place within the bladder or kidneys, it may lead to the formation of stone and give rise to trouble. (See under BLADDER, DISEASES OF THE, also KIDNEY DISEASES.)

Green Sickness.—Another name for chlorosis, the commonest form of bloodlessness or anæmia. It is so called from the somewhat greenish pallor which the face of sufferers from this complaint assumes. (See under ANÆMIA.)

Gripes.—A common name for colic in children. (See under COLIC.)

Gripe, or La Grippe, is a synonym for influenza. (See INFLUENZA.)

Groin, Affections of the.—The special affections of this region are:

1. A moist, eczematous condition of the skin in the fold between the front of the thigh and the lower part of the abdomen is apt to appear in babies, and also in stout people. To prevent this in children it is necessary to pay every attention to keeping the parts dry. If it should form then, apply a dusting-powder, such as equal parts of finely-powdered starch and boracic acid. In adults the same precautions are necessary, but the surfaces may also be kept apart by a layer of cotton-wool, frequently changed, or a piece of lint.

2. *Swollen Glands.*—Apart from bubonic plague, the commonest cause of acute, painful swellings in the glands of the groin—or "buboes," as they are often called—is gonorrhœa. (See under GLANDS, and also under VENEREAL DISEASES—*Gonorrhœa.*) In syphilis, small swellings of the glands, of a hardness like shot, are very common, and are an important point often in the early diagnosis of syphilis. (See VENEREAL DISEASES—*Syphilis.*)

3. A swelling in this region may also be due to a hernia or rupture. (See HERNIA.)

Growing Pains.—Slight pains in the limbs, usually about the joints, and sometimes also in the back, are often attributed, when occurring in children or young persons, to growth, especially if in a person who is lanky and growing up rather rapidly. In all probability there is no such thing, however, as growing pains. These pains may have more than one origin, but in a large proportion of cases they are definitely due to rheumatism of a not very acute kind, but which, if undetected and allowed to go on untreated, may seriously affect the child for life by producing typical rheumatic valvular disease of the heart. We would therefore advise any one believing himself or any one under his or her charge to be suffering from "growing pains" to consult a doctor as to their real nature, and particularly to see whether there has or has not been any heart mischief done.

Guinea-worm Disease.—See under PARASITES.

Gumma.—This is the name applied to hard, usually painless, swellings which may form in almost any portion of the body, but only in persons who have uncured syphilis. There is nothing just very distinctive about their appearance, but, once their nature is recognised and appropriate anti-syphilitic treatment used, they usually quickly disappear. (See VENEREAL DISEASES—*Syphilis.*)

Gums, Affections of the.—*Spongy gums*, in which the gums become soft, swollen, and bleed readily, are one of the earliest signs of scurvy; they may also occur in persons working with or being over-dosed with mercury. The local treatment necessary is the use of a mouth-wash composed of alum—about a teaspoonful of the crystals dissolved in a large cupful of water.

Ulceration of the gums around the teeth, with secretion of a lot of saliva, foul-smelling breath, pain on chewing, sometimes going on to loosening and dropping out of teeth, is generally due to inflammation going on at the junction of the teeth and gums, and is associated with imperfect care of the teeth. A visit to the dentist will be necessary, together with the use of antiseptic mouth-washes. The gums may also be affected by various inflammatory conditions affecting the mouth as a whole. (See MOUTH, DISEASES OF THE.)

Gumboil, or *Alveolar Abscess.*—The development of a gumboil is practically always associated with the presence of one or more decayed teeth, and is due to suppuration extending from the tooth into the gum around its root. A swelling appears in the gum at the side of the tooth which is tender; the pain is at first relieved by clenching the teeth, or by keeping a pad of some sort between the gum and the cheek. After a day or two the swelling may subside and the pain disappear, but if it increases, and any redness develop on the cheek outside, it is certain that there is pus there which requires letting out, else it will burst out itself, either inside the mouth, or, what is much worse, through the cheek or about the chin. The treatment requires in many instances the removal of the offending tooth, or any cavity in it may be packed tightly with a little plug of cotton-wool soaked in pure carbolic acid, great care being taken that none of the acid is allowed to run over the mouth, or a nasty burn will result. The gumboil may be brought more quickly to a head by applying poultices or fomentations to the face, but, whenever the swelling attains any size, and particularly if the skin over it is getting red, or if it feels elastic as if there were fluid (*i.e.* pus) inside it, the sooner it is opened by a doctor the better. The opening is usually made inside the mouth, and healing up very soon occurs.

Tumours of the Gums.—These sometimes occur in the shape of fleshy-looking growths, generally close to the teeth, and sometimes burrowing in between them. Some are malignant and dangerous, but most are not. The distinction between them can, however, often be made only by removal of a small portion for microscopic examination.

Habits, Drug.—See section of the book dealing with Drug Habits.

Habit-spasm.—See under CHOREA.

Hæmatemesis (vomiting of blood).—Blood brought up from the stomach is usually dark in colour, resembling coffee-grounds, unless it be coming from a large hæmorrhage, when it may be bright red. If the vomiting of blood which has been swallowed—from the nose, &c.—be excluded, then the commonest causes of vomiting of blood are gastric ulcer and cancer of the stomach. It always is or may be a serious condition, and there should be no delay in obtaining medical advice. Until this is got, the best thing for the patient is to keep absolutely quiet, lying on the flat of the back with the head low. It is sometimes advised to suck ice and to place icebags on the abdomen, but, on the whole, it is probably better to do neither. The only thing we would advise is that 15 or 20 drops of laudanum be taken in a mouthful of water. (See under STOMACH DISEASES, also VOMITING, and in the First Aid section.)

Hæmaturia.—The conditions giving rise to the presence of blood or of blood-colouring matter in the urine are mentioned under BLADDER, DISEASES OF THE, in the part dealing with abnormal appearances of the urine, to which the reader is referred. We would merely say here that the conditions giving rise to the presence of blood in the urine are usually deep-seated and requiring skilled treatment.

Hæmophilia.—A constitutional disease, the subjects of which are commonly known as bleeders, because the slightest cut, scratch, or injury may be followed by excessive bleeding, which can only be stopped with the greatest difficulty. Bleeding may come not only from injuries, but it may arise spontaneously, without any apparent cause, from the nose, stomach, bowels, &c. In most cases it comes, not from the rupture of one large vessel, but in the form of a steady oozing from the capillaries. One of the most curious features about the disease is the nature of its hereditary transmission, for it is one of the diseases with a very marked tendency to run in families, the signs of its presence usually appearing in infancy or early childhood. Males are affected much more than females, in about the proportion of 10 to 1. It is by the females of affected families, however, that the tendency is transmitted, possibly through many generations. In other words, the males of hæmophilic families, although themselves possibly bleeders, do not transmit the tendency to their offspring; while, if the females, themselves probably not bleeders, have children, some, if not all, of the male children will be bleeders, the females being unaffected, but carrying on the tendency to the next generation. Jews are known to suffer more from this condition than any other race. Occasionally isolated cases of the disease crop up, and it has been noticed that it is usually associated with a very fine, smooth type of skin. The tendency to hæmorrhage may be outgrown, but, on the other hand, bleeders often die young from hæmorrhage which cannot be stopped. Pulling of teeth, operations, and even vaccination, are procedures which it is dangerous to undertake in a bleeder. The cause of the tendency is unknown, but it seems to be something which is lacking in the blood, from the absence of which it does not clot, so that, when once bleeding starts, it simply goes on, if active means are not taken to stop it. For an interesting description of a family of bleeders the reader may consult Zola's *Dr. Pascal.* For the arrest of hæmorrhage in a bleeder, firm pressure over the bleeding point with a pad (of gauze or lint, or of clean linen), kept in position for a considerable period with a bandage, will usually be found the most satisfactory method. Often, but not always, it is found that the blood may be started to clot, and the bleeding thus stopped, by a drop or two of blood from a healthy person being applied to the bleeding-point. Internally the use of calcium chloride has been recommended.

℞ Calcium chloride	3 drachms
Fluid extract of liquorice . . .	6 ounces

Dissolve. Sig. A tablespoonful thrice daily after meals for a few weeks occasionally.

Bleeders must, of course, be protected as far as possible from any injury. The only way to stamp out the disease would seem to be to prevent the marriage of the daughters of hæmophilic families.

Hæmoptysis.—The causes of spitting of blood are mentioned under Expectoration. Generally speaking, it is the result of some disease of the lungs or of the heart. Until the cause can be ascertained, the patient should keep perfectly quiet in a recumbent position, ice may be sucked, and 15 or 20 drops of laudanum may be administered.

Hæmorrhage.—The control and arrest of external hæmorrhage, which is usually the result of injury, is treated in the section dealing with First Aid. The causes and arrest of internal hæmorrhage, which is, in the great majority of instances, due to disease, are for the most part considered under separate headings, such as Epistaxis (bleeding from the nose), Apoplexy (hæmorrhage into the brain), Hæmatemesis (vomiting of blood), Hæmaturia (blood in the urine), Hæmoptysis (spitting of blood), and Melæna (blood in the stools). Of course it must be remembered that internal hæmorrhage may not show itself definitely—that the bleeding may be into one of the cavities of the body, such as the chest or abdomen, or into the tissues, in which case it may form a definite swelling (hæmatoma). In the former instance the hæmorrhage can only be diagnosed from the patient becoming more or less quickly faint, cold, and pale or even blanched in appearance. The general principles of treatment in all cases of internal hæmorrhage are practically the same. A doctor should always be sent for, because the condition is often a serious one. Until his advice is obtained the patient should lie absolutely quiet and perfectly flat. This makes the work of the heart as light as possible, and, by lessening the force of the circulation, encourages the coagulation of the blood and the natural arrest of the bleeding. No stimulants must be given upon any consideration, even should the patient faint, for fainting in this instance must be regarded as a desperate remedy on Nature's part to obtain rest and clotting of the blood. Cold applications over the part where the hæmorrhage is occurring may be tried, provided that the patient is not disturbed in putting them on. They not only aid coagulation, but they quieten the patient's anxiety, as he feels that something is being done. It will generally be quite allowable also to give a little laudanum (say 15 or 20 drops) for its quieting effect, but the administration of any other drug had better be left to the doctor.

For excessive or irregular hæmorrhage in connection with menstruation, or before or after childbirth, see under Menstruation, Disorders of, and Labour, Complications of.

Hæmorrhoids.—See Piles.

Hair, Affections of the.—See under Skin Diseases, also Baldness.

Hallucinations.—Although these sometimes occur in sane people from some slight brain derangement such as results from fever, sleeplessness, overwork, &c., they are usually a symptom of insanity, and for further consideration that heading should be consulted.

Hammer-toe.—See under Bunion, and Toes, Affections of the.

Hand, Affections of the.—Diseases affecting the skin of the hands and the nails are considered under Skin Diseases. See also Chaps and Chilblains. If the hands look very blue and are always cold, it may merely be a sign of rather poor circulation, but it may indicate serious heart disease, particularly if these features be combined with a swollen, club-shaped appearance of the finger-tips. Fingers becoming first cold, white, and waxy-looking, later blue and painful, are characteristic of the condition known as *Raynaud's disease.* (See RAYNAUD'S DISEASE.) *Abscesses of the fingers and hand* are considered under WHITLOW. Rounded painless swellings, consisting of a collection of fluid about the back, or, more rarely, the front, of the wrist are dealt with under GANGLION. Bulbous swellings of one or more fingers sometimes appear in children or young people; these are, in all probability, *tubercular* in their nature, and require to be dealt with in much the same fashion as chronic or tubercular abscesses. Chronic or *tubercular abscesses* also often have their site in the wrist joint. (See ABSCESS, CHRONIC.) Other joint affections also frequently affect the joints of the fingers and hands, producing bony enlargement and deformities about these joints. (See JOINTS, AFFECTIONS OF THE, also GOUT, RHEUMATISM, and RHEUMATOID ARTHRITIS.) Other deformities of the fingers and hands are considered under CONTRACTURE and DEFORMITIES. Certain diseases of the nervous system have characteristic manifestations in the hands. Thus there is the typical tremor or pill-rolling movements of shaking palsy or *paralysis agitans;* general tremulousness in *exophthalmic goitre,* also from alcoholic excess and from simple old age; a more coarse tremor or shake, especially on making any voluntary movement, in *disseminated sclerosis;* irregular, jerky movements in *chorea,* or St. Vitus' dance; *wrist-drop* in neuritis, resulting from long-continued abuse of alcohol, chronic lead-poisoning, and occasionally from other poisons; wasting of the small muscles in the ball of the thumb and opposite the base of the little finger in the disease called *progressive muscular atrophy;* loss of sensation for pain and for heat and cold, so that the patient is apt to get injuries and burns without being aware of the fact, in the disease of the spinal cord known as *syringomyelia* (this may be combined with wasting, as in progressive muscular atrophy). (See under NERVOUS DISEASES.)

Hare-lip.—See under DEFORMITIES.

Hay-fever.—This condition, due usually to the inhalation of hay-pollen, consists of attacks like a severe cold in the head, with tremendous fits of sneezing, running eyes and nostrils, and sometimes bad headache. Occasionally, also, there are typical asthmatic attacks, with wheezy, difficult breathing, along with the hay-fever. (See ASTHMA.) These attacks may last a week or so, and in sensitive persons are liable to recur during the summer months. They are due in most cases directly to the inhalation of pollen from hay, and therefore are only liable to occur during the time which hay is in bloom. Sometimes, however, the pollen of other flowers may set up the same condition, and in some persons the odour of cats, dogs, or other animals can cause a condition absolutely analogous with hay-fever, just as they may also set up bronchial asthma in certain individuals. There is a powerful poison in the pollen, especially in that of certain of the grasses in "hay," and a special antitoxin called "pollantin" has now been prepared for use as a specific against hay-fever. All persons are not sensitive to this poison, however, and apparently there must be a special sensitiveness of the mucous membrane of the nose; and in most cases the persons who suffer from hay-fever, like those who suffer from asthma, are of a nervous stock. Very often there is a definite hereditary tendency to suffer from hay-fever, although it is noteworthy that men suffer considerably more than women.

The most effective treatment is that of prevention, the patient keeping clear of the neighbourhood of grass- and hayfields in the summer-time, going, if possible, to the seaside, for a voyage, or to some place at a considerable altitude. If this cannot be done, then they may wear a respirator during the hay season, and keep their bedroom windows shut at night. It is always advisable to have the nose examined, for, even if no special diseased spot is found, the cauterising of some of the membrane is often found to lessen the sensitiveness to attack. A few drops of pollantin applied locally to the nose every morning will in most cases, however, entirely prevent attacks, and will also cut them quickly short if they have already commenced. Should this remedy be unsuccessful or unobtainable, then the nostrils should be painted every few hours with a few drops of a 10 per cent. solution of cocaine while the attack lasts.

Headache and *pain in the head* are symptoms which may arise from a considerable number of different causes; there are also varied types of headache, so that it is necessary to consider the various origins and varieties of headache in order that the proper treatment may be adopted. Sometimes it is an easy matter, at other times an exceedingly difficult one, to discover why any particular person has a headache or suffers repeatedly from headaches.

Headache may be defined as diffuse pain in the head. Pain of a sharp, shooting, paroxysmal character, and confined to the area of some particular nerve, is characteristic of neuralgia. This is considered separately. (See NEURALGIA.) Another special variety, of extreme severity, known as sick headache, bilious headache, or migraine, which usually attacks only brain-workers, is of a pulsating or throbbing character, and generally confined to one side of the head, and accompanied by nausea, vomiting, and the appearance of flashes of light or other defects of vision, and great prostration. This is also considered separately. (See MIGRAINE.)

Pain in the head arising from injuries or diseases affecting the scalp or bones of the skull feels superficial, and, as the cause is usually apparent, this form of pain can hardly be confused with headache. In headache the pain usually feels deep in the head; there is one fairly common exception to this rule, however, and that is *rheumatic headache.* This is superficial, and there is in addition actual tenderness of the scalp, which is noticed, for instance, when the person is brushing the hair. This form of headache is most amenable to treatment by means of salicylates, exactly like other rheumatic affections—say 5 or 10 grains of salicylate of soda, in powder or tablet form, thrice daily after meals. (See also RHEUMATISM.)

Syphilis is another condition which may give rise to headache accompanied by tenderness of the scalp, but, if it affects the brain only without the scalp, there will be deep-seated headache without any tenderness. Both forms are curable by iodide of potash given in large doses if the brain is affected.

In this instance medical advice should certainly be obtained. *Tumours* and *abscesses of the brain* give rise to very severe headaches, which can only be relieved by the use of opium or surgical operation. These form, however, but a very small number of the cases of this common complaint. We now come to a much larger group, which may be termed *referred headaches,* as the exciting cause, which may be perfectly localised and definite, is not in the head, where the pain is felt. This group includes headaches from the following causes:

Scalp conditions, such as the presence of lice or the wearing of heavy or tight hats. Both of these may cause distressing headache. The treatment required is fairly obvious. (For removing lice see under PARASITES.)

The *eyes* are a very common source of headache, which is situated either right above the eyes or else at the back of the head and nape of the neck. This is one of the commonest causes of headache in children, the defect being usually some error in refraction requiring the prescription of glasses. In adults, eye-headache will be found to come on after the use of the eyes for close work, such as sewing or reading, in the majority of cases. Too much looking at bright lights or rapidly-moving objects, as from a train, easily produce eye-strain and headache. A night's rest will usually relieve these.

Diseases of the nose and of the cavities opening off it may cause headache, which is felt at the root of the nose and extending from there directly backwards to the back of the head; it is made much worse by coughing or bending forwards.

Ear conditions, especially wax and middle-ear inflammation, may cause not only earache, but also headache, affecting the whole of the side of the head, or even both sides.

Almost any *tooth affection* may cause headache; much more frequently, however, the pain in this instance is definitely neuralgic in nature, being felt along the upper jaw, the lower jaw, or taking the form of earache, and it must be remembered that the tooth itself may be painless. The services of a dentist will be required, but temporary relief can sometimes be obtained by mouthfuls of hot water, or of hot water containing a little fluid magnesia or milk of magnesia, or by putting round the tooth or in the cavity, if there be one, a plug of cotton-wool with a drop or two of oil of cloves on it. (See TEETH, AFFECTIONS OF THE, and also NEURALGIA.)

The *reproductive organs* may be the cause of headache, especially in women. Thus, diseases of the ovaries or of the womb may set up headache, sometimes on the top of the head, but usually at the back of the head, and of a sharp radiating character. The headaches associated so frequently with the *menstrual periods* may also come into this group; sometimes they are rather a sign of a more general neurasthenic condition, which is always more pronounced at these times; but perhaps they fall most often into the next group of headaches—viz. those dependent on blood impurity.

For the relief of headache arising from any of these conditions, some drug out of the following list is frequently employed quite justifiably, although it should be borne in mind that they are mere pain-killers, leaving the root of the evil quite untouched. The drugs most employed are antipyrin, antifebrin (or acetanilid), phenacetin, phenalgin, and aspirin. Of these, it may be said that the last has the least pain-deadening action; it is a salicylate preparation, and works very effectively if there is any rheumatic element in the headache. It may be taken in the form of one or two 5-grain tablets every three or four hours, the patient going to bed, or at least keeping in the house warm, because there will probably be free perspiration. The drawback of all the others is that they have a deteriorating action on the heart and blood, and must therefore be taken with great caution if the invalid's heart is at all weak. The least depressing, and therefore safest, is phenalgin; this is usually obtained in the form of 2½-grain tablets, of which from two to four may be taken, and repeated in four hours, if necessary. Unfortunately it is rather expensive, so that one is often compelled to use the next best, which is phenacetin. This may be had in tablet form, each tablet containing 4 grains, along with 1 grain of citrate of caffeine to counteract its depressant action. One or two of these may be taken, and also repeated in four hours if required. Antipyrin and antifebrin are so depressant that they should never be taken except under a doctor's order. We would especially warn readers against antifebrin; this drug is the main constituent of most of the headache and neuralgia powders and tablets which are so extensively advertised, and there have been quite a number of regrettable accidents through their use. Another bad feature about it is that it loses its effect, so that bigger and bigger doses have to be employed, and an antifebrin habit comparable to the morphia habit is not infrequently established.

Other means of affording temporary relief from headache are the application of cold to the head, in the form of ice-bags or cloths wrung out of cold water. This acts specially well when the head is throbbing, as in the headache of fever. (See below.) If the rest of the body feels cold, as is often the case, steps should be taken to keep the body and extremities warm. Firm pressure to the head by means of a handkerchief or bandage is also occasionally of service. Electrical applications, if they can be obtained, are frequently found to give wonderful relief.

A large number of headaches may be grouped together as due to *bad or poor blood.* These are undoubtedly the most common, and some source of blood impurity should be kept in view when dealing with any case of headache of uncertain origin. Amongst the commoner sources are the following:

Anæmia, or Bloodlessness.—Commonest in anæmic women, and causing headache, which is usually on the top of the head, sometimes at the forehead or back, and associated with a feeling of pressure. It is also apt to be paroxysmal, shooting and neuralgic in character, and particularly bad at the menstrual periods.

The opposite condition, excess of blood, or *plethora,* such as one sees in stout, full-blooded, overfed people, is also liable to cause recurrent headache. This is best treated by limitation of the diet (if the patient will consent to limit it, which is by no means always the case), and free purgation with calomel at night and salts in the morning.

High blood pressure, whether the result of degenerated arteries (see ARTERIES, DISEASES OF THE) or of Bright's disease or other cause, may cause headache of a throbbing, shifting character, often accompanied by dizziness and sounds in the ears. Persons with this condition must lead a quiet, simple life, such as is referred to under DISEASES OF ARTERIES. Headache appearing after middle life, and at the back of the head, should always be suspected as being due to chronic Bright's disease or to arterial disease.

Indigestion and Constipation.—This is perhaps the commonest of all sources of headache. It is usually throbbing, and affects the brow region over the eyes, and is made worse by sudden movements of the head. No one form of treatment is applicable to all cases falling under this head, but most of the indications will be found by consulting the sections dealing with DYSPEPSIA and CONSTIPATION. The diet will, in many instances, require modification; some require feeding up, others, especially if past middle life, require the amount diminished, particularly with regard to animal food. Complete cutting out of all flesh foods is successful in curing some cases; but the opposite plan, the Salisbury diet, consisting of practically nothing but meat, may also be successful. Generally speaking, however, we may say that a light, simple, mixed diet, small rather than large in amount, and thoroughly well masticated, is most likely to suit the majority. A change of air and outdoor exercise will often also work wonders in these conditions.

Almost all *fevers* may be accompanied by headache, sometimes very severe, and usually throbbing in character.

Intoxications, not only by alcohol, but also by lead, tobacco, and such drugs as quinine, may be followed by headache.

There still remain some causes of headache which do not fall under any of the foregoing groups.

Neurasthenia—i.e. general nervous exhaustion or severe "run-downness." This is fairly common in these days of rush and hurry. The type of headache here is either a bearing-down headache from the top of the head, or else a feeling like that of a tight band round the head. It is characteristically worse in the morning, wearing away later on in the day, like many other neurasthenic manifestations. A complete rest-cure and feeding up will be required in bad cases; in milder ones, a good holiday, with change of scene and freedom from business cares and worries, may suffice. (See NEURASTHENIA.)

Simple over-exertion, either mental or muscular, *violent emotions, hot weather,* or *low barometric pressures,* are all at times responsible for headaches; also hot, *stuffy rooms,* which, however, act by producing impurity of the blood. Hysteria is occasionally accompanied by headache of a peculiar type—namely, a feeling as if a nail were being driven into the top of the head; this is a rare condition.

For the treatment of headaches due to morbid states of the blood, the great thing is to get at the underlying disease and treat it, remembering that the headache is but a symptom of that. For temporary relief the same measures may be employed as are referred to above in connection with "referred" headaches.

Head-nodding.—Nodding or rotatory movements of the head, usually associated with similar movements of the eyes, are not infrequently seen in young children, usually of rather a nervous type. In most cases no special treatment is required, for the movements disappear of their own accord by the time the child has got all its first teeth. In feeble-minded children they may persist, but nothing can be done for them.

Heart, Affections of the.—The chief symptoms which will lead one to suspect that all is not as it should be with the heart are: shortness of breath, especially on going up a stair or on any exertion; palpitation, which is excited action of the heart, and the recognition by the patient of the forcible beating of the heart, a condition which in health one should never be aware of except after very severe exertion; lividity or pallor; giddiness and a tendency to fainting; swelling of the feet and ankles towards night, going on gradually to general dropsy; and pain or a feeling of oppression in the region of the heart. It should be remembered that a person may have a heart which is not quite sound for a long time, and never be aware of the fact. The heart possesses to a remarkable degree the power of compensation or adapting itself to abnormal conditions, chiefly by enlargement or hypertrophy. This certainly encroaches upon the reserve powers of the heart, making a breakdown of easier occurrence should any unwontedly heavy strain be put upon it; but should any such strain never occur, the person may go through life without ever being aware of the fact that he has a heart, and be able to enjoy as long and as useful a life as if the heart had been perfectly sound. This is, of course, the most favourable side of the shield, but there is another, which condemns the sufferer to a life of at least semi-invalidism. Between these all degrees of incapacity through heart disease occur, but we would like at the outset not to alarm readers unduly, by giving the impression that heart disease invariably renders a person useless for life and liable to die suddenly at any moment. In a few cases this may be the state of affairs, but in the great majority both statements are as far from being true as black is from white. We do not propose to go in great detail into the different kinds of disease to which the heart is liable. The symptoms from which the patient suffers are, for the most part, of the same type in them all. It is only a trained medical man who can tell by examination what the exact details of the disease are, and to what degree the heart is affected; and as, naturally, a doctor should always be consulted if anything wrong with the heart is suspected, it is unnecessary to do more than indicate the ways in which the heart may be affected, the chief varieties of "heart disease," their leading symptoms, and the lines on which treatment is carried out, leaving the details to be supplied for the individual case by the doctor in charge. We might just remark here that what is usually meant when a person is said to suffer from "heart disease" is valvular disease of the heart. That will be considered as one of the varieties of heart disease, using the term in the wider sense of all affections of the heart.

Congenital Malformations of the Heart.—Imperfect development of the heart may occur to such a degree as to be quite incompatible with life, and, on the other hand, certain malformations may exist without giving rise to any symptoms, the condition being perhaps only discovered accidentally through examination for life insurance, &c. These two forms of malformation do not require further mention. In a third class of malformations life is possible, but only upon very precarious conditions. The children are often known as "blue babies," being so blue and cold, especially on the extremities. The fingers and toes become club-shaped at their ends, and the little patients are very breathless on exertion. They have always a tendency to bronchitis, and often to consumption. With such children a long life can never be looked for if the malformation is at all a bad one, and they must always be looked after with the greatest care with regard to exposure to cold or the performance of any violent exercise. The time of greatest danger is about puberty, when the period of most active growth occurs. The heart is not always capable of corresponding growth; but if this period is successfully passed, then the further outlook, provided always that great care is taken, is not so unfavourable.

Pericarditis.—Inflammation of the exterior of the heart, and of the sac in which the heart lies. This is usually rheumatic in its origin, sometimes part of a definite attack of rheumatic fever, sometimes an isolated manifestation of rheumatism, occasionally due to other causes altogether. If part of an attack of rheumatic fever, it will hardly give rise to any special symptoms, but is one of the conditions that the doctor will always be on the look-out for, although it is much less serious than endocarditis. (See below.) If an isolated affection, it is characterised by pain over the heart—not, however, very severe, as a rule—feverishness, feeble, rapid, and often irregular pulse, and a varying amount of breathlessness. The latter is proportionate in amount to the amount of watery effusion which occurs with the inflammation; sometimes there is practically none, in other cases a considerable amount, which embarrasses the action of the heart. Recovery usually occurs, although the heart may be left in a somewhat weakened state from the adhesions which form. The patient must be kept completely at rest in bed, and on very light diet, so long as there is any fever. Poultices, blisters, or ice-bags (if the heart is strong) are usually applied over the heart, and salicylates and other medicines administered. If much fluid is poured out into the pericardial sac, it is sometimes necessary to have this drawn off.

Endocarditis.—Inflammation of the membrane lining the interior of the heart, more especially of the valves of the left side. This takes two forms, acute and chronic. *Chronic endocarditis* results in valvular disease, and as it gives rise to no special symptoms until those of valvular disease show themselves, and so is not likely to be suspected, the reader is referred to *Valvular Disease*. *Acute endocarditis* may be further subdivided into two forms: (*a*) ulcerative or malignant, and (*b*) simple. *Ulcerative endocarditis* is a very serious—in fact, almost an invariably fatal—condition. Luckily it is not a very common one. There are few symptoms directly referable to the heart, its features being those of an intense blood-poisoning. The patient is very feverish, has shivering fits, copious sweating, prostration, distressing breathlessness, sometimes delirium, and sometimes pain or the development of abscesses in various parts of the body, from parts of the ulcerating valve breaking off and being carried away in the bloodstream. It is apt to arise from puerperal fever (*i.e.* after childbirth), pneumonia, septic wounds, &c. Very little can be done in the way of treatment. *Simple endocarditis* is, practically speaking, always a rheumatic condition, and is the great complication which is to be feared in an attack of rheumatic fever. It may also arise from other rather less acute forms of rheumatism, in which the joints are specially affected, and from tonsilitis and chorea (St. Vitus' dance), the latter of which must be regarded as always a rheumatic affection, while tonsilitis often is. Not infrequently acute endocarditis develops after scarlet fever also. The inflammatory process on the valves consists in the formation of warty growths like the heads of a cauliflower, which, as they heal, shrink and damage the valves. Children and young adults suffer most. In many cases there are no special symptoms while the acute inflammatory process is going on, more especially if it be part of a definite attack of rheumatic or other fever; it is a condition which has to be looked for by the physician. In other instances there will be some palpitation, pain, or a sense of oppression about the heart, a somewhat quickened and perhaps slightly irregular pulse, but the condition can only be made out with certainty by careful sounding of the heart. The main thing in treatment is to keep the patient absolutely at rest, not even allowing him to sit up, whenever there is the slightest suspicion of the heart being affected (and, even if there is not, as a preventive measure in rheumatic fever). For further details see under RHEUMATIC FEVER. The results of acute simple endocarditis are damaged valves and a heart permanently more or less weakened. For further consideration see *Valvular Disease* below.

Valvular Disease of the Heart.—This is the commonest and most important affection of the heart, and is what is usually referred to when a person is said to suffer from heart disease. Valvular disease arises in two very distinct ways. In young persons it is practically always the result of endocarditis (see above), the flaps of the affected valve or valves either becoming partly united, and so narrowing the orifice, or the flaps becoming so shrunken and deformed that they are too small to close the orifice, and the blood can escape backwards through the valve. The former condition is called "stenosis," the latter "incompetence." Sometimes the thickened flaps or cusps of a valve both obstruct the flow of blood past them, and at the same time fail to close properly, so that both stenosis and incompetence are present. The valves which suffer most in this way are those of the left side of the heart—viz. the mitral valve, between the left auricle and the left ventricle, and the aortic valve, at the commencement of the aorta. The valves of the right side suffer much less strain, seeing that the right side has only to keep up the circulation through the lungs, while the left has the circulation throughout the whole body to keep going. Hence the valves on the right side are much less frequently the seat of valvular disease.

In older persons the valves may also occasionally be affected by acute endocarditis, but more frequently the change is rather of the type of a degeneration than an inflammation, and is strictly comparable to the change which goes on in the arteries. (See ARTERIES, DISEASES OF THE.) The aortic valve is the one which suffers most; men are affected chiefly, especially those who have led lives involving very hard muscular exertion, or who have been alcoholic, or had syphilis or Bright's disease. Whatever be the origin and variety of the valvular defect, Nature's method of remedying it is much the same—viz. enlargement of the chamber behind the affected valve, with hypertrophy of the heart muscle. This may completely overcome the valvular defect, and is the essence of what is called "compensation" in heart disease. So long as compensation is perfect the individual will have no symptoms, except that, since the reserve power of the heart is always encroached upon by this process, he will be shorter of wind and less able for any sudden or severe exercise than a person with a sound heart. Also, sooner or later compensation is liable to break down, either through too sudden or too great a demand being thrown upon the heart, or because the nutrition of the enlarged heart cannot be kept up, and degenerative changes gradually occur in it, and the typical symptoms of heart disease gradually come on as compensation fails. These symptoms, of course, vary somewhat with the particular kind of valve defect which has been produced; but it is not necessary here to indicate more than the general symptoms and treatment, since the exact nature of the affection and the details of the treatment must be left to the patient's medical adviser to determine.

Shortness of breath and palpitation are usually among the first symptoms indicating broken compensation. The breathlessness at first will only be noticed on exertion, such as going upstairs; later on it may be constantly present, even to the extent that the patient cannot lie down, but must always be propped up, even to sleep. The palpitation may be accompanied by actual pain in the region of the heart, and in some instances this is so severe as to amount to actual angina pectoris. (See ANGINA PECTORIS.) The patients are apt to be giddy, and to feel faint, or even to have actual fainting fits, especially on sitting suddenly upright or getting any sudden shock. Cough and watery sputum are almost constant; in old-standing cases the sputum is often blood-streaked, but this need not give rise to anxiety. Swelling of the feet and ankles towards night is another early sign of failure of compensation. If this gets worse, the dropsy gradually extends up the lower limbs, and may ultimately involve the whole body. Other symptoms are dyspepsia, slight jaundice, development of piles, sleeplessness, coldness and blueness of the extremities. The pulse varies considerably in different forms of, and at different stages in, heart disease. Sometimes it is very large, strong, and bounding, at others small, feeble, and very irregular. The carotoid arteries in the neck may sometimes be seen to throb violently, even when the patient is quite at rest; sometimes the veins under the skin in the neck can be observed to be very full and prominent, or even pulsating. On examining the chest over the heart in the earlier stages, strong beating will very likely be visible; with failure of compensation and weakened action this may disappear.

Treatment.—In the first place there must be considered the mode of life suitable for a person with valvular disease, but in whom there are no symptoms, compensation being fully established. The majority of cases of heart disease come within this category at first, and, provided that they recognise their limitations and live accordingly, they may never fall outside it, but be able to lead long, busy, useful lives. Outdoor exercise in moderation is usually advisable—that is to say, it should never be indulged in to such an extent as to tire, to cause shortness of breath, or palpitation. This is a point of extreme importance, because a single overstrain may damage the heart to such an extent that complete compensation is never completely regained. Hill-climbing, lifting heavy weights, running to catch trains, long bicycle rides, and the like, must therefore be guarded against. Baths should not be taken either very hot or very cold, Turkish baths being especially dangerous. The clothing should be fairly warm, and such persons should never be exposed to severe cold, as the contraction of the blood-vessels in the skin throws a considerable extra strain on the heart. The diet should be light and easily digested, large meals being specially avoided. The amount of fluid taken is better to be small, a dry dietary being preferable. Any article of diet producing flatulent distension had better be avoided altogether. (If flatulence is present, soda-mint tabloids or other antacids may be swallowed an hour or so after meals. See FLATULENCE and DYSPEPSIA.) Alcoholic liquors are best avoided completely, and even tea and coffee should only be taken in moderation. Smoking may be allowed, so long as it is also moderate in amount, and not producing any irregular action of the heart and palpitation. Sexual intercourse is another thing which must only be indulged in in moderation. The question of marriage sometimes comes up for consideration, especially in the case of female patients. Each case must be judged on its own merits, but, speaking generally, we would say that in bad cases patients should not marry, and almost always the condition of the heart is aggravated by the strain attending confinement. Constipation and straining at stool are to be carefully guarded against, and any disease, even a slight cold, in a person with heart disease must be treated with more consideration and care than might be considered necessary in a perfectly sound individual. If these directions are followed out, it is extraordinary how long persons may go without suffering any symptoms from their heart disease.

When compensation breaks down, either through indiscretion or through natural failure, other measures become necessary. Rest is the first essential. By complete rest in bed the number of beats of the heart per day is diminished by thousands, and consequently the work it has to do is immensely less. In many mild cases taken early, a few weeks' rest in bed will be all that is required for the heart to regain its tone. At this stage the advice of the patient's medical adviser should always be obtained, because in many instances the employment of special heart tonics will be necessary, and the proper selection of these, their dosage, and the time over which they require to be employed, is a matter which can hardly be decided without expert advice. Special symptoms have to be met as they arise. The old-fashioned remedy of bleeding is still used occasionally, and with advantage where there is great congestion of the venous side of the circulation. For the measures employed to relieve dropsy see under DROPSY. The diet is often advisedly a dry one, not more than about a pint of fluid being taken per diem. This will help immensely to diminish dropsy. When dyspepsia and vomiting are present, it helps to have a mustard-leaf or poultice applied frequently over the stomach, and the food may have to be taken in very small amounts, often repeated, such things as plain milk or peptonised milk, or meat essences, being the most easily borne articles. Farinaceous and starchy foods must be dropped altogether, as they produce too much wind, which aggravates the palpitation and breathlessness. Drugs are sometimes required for sleeplessness, and it is no uncommon thing in advanced cases for the patient to have to sleep sitting propped up. Pain about the heart is sometimes relievable by the application of an ice-bag over the heart; often the administration of drugs, such as iodide of potash or nitro-glycerine, or even of morphia, is necessary. Naturally the last has to be used with caution, and its effect on the heart carefully watched.

In many instances there comes a time when rest and drugs are found insufficient to restore the stage of compensation. This is the time for the employment of a method, the essence of which consists in gradually increasing the work which the heart has to do, and so regaining its tone. The method has been worked out especially by Dr. Schott of Nauheim, and the employment of it does not come amiss occasionally in any case of heart disease to maintain the tone of the organ. It is not necessary to go to Nauheim to have the treatment carried out, for it can be quite satisfactorily managed at a number of hydropathics and establishments in this country, or even at the patient's own home, with the aid of a well-trained masseur. Briefly stated, the method consists in the use of certain baths, either of the natural waters or of artificially prepared water, and the employment of a graduated series of exercises, beginning with general massage, then going on to passive movements of the limbs and body, then of active movements on the part of the patient against resistance on the part of the operator. Finally, the patient is allowed up, and to undertake gradually more and more physical work. By these means a great deal can be done even in what seem like cases of heart disease in a very bad way.

Enlargement of the Heart.—This may be either a dilatation or stretching of a chamber or chambers of the heart, without any corresponding enlargement or thickening of the heart muscle or wall of the chamber, or it may be dilatation plus hypertrophy of the heart muscle. Let us first consider *simple dilatation* without hypertrophy. This is apt to occur in almost any acute fever, but especially in diphtheria and influenza, as a result of the action of the poisons produced in these diseases on the heart muscle. In anæmia a similar condition occurs. Over-indulgence in tobacco may also be responsible. In hearts in which there is hypertrophy of the muscle, dilatation out of all proportion to the muscular thickening may occur; this, in fact, is what happens when compensation breaks down in a person with valvular disease or with an enlarged heart from disease of the arteries, Bright's disease, &c. Lastly, dilatation may occur in a person in perfect health from physical overstrain, although it is, of course, more likely to occur in any one attempting too much when not in training. This is what is referred to when a person is said to have "strained his heart"—a sudden over-dilatation. The symptoms are much the same as those of broken compensation in valvular disease, but the feeling of actual distress or pain about the heart is usually very marked, and palpitation and faintness come on from the slightest exertion. The heart's action and the pulse are very irregular and fluttering, and sleeplessness is frequently complained of. The condition may be a very grave one when coming on after fevers (hence the necessity of great care in allowing patients to sit up, or on returning to work), or in older people with heart disease. With care, however, it may be completely recovered from, but it usually requires a considerable time. The first essential in treatment, as in most heart conditions, is rest. This may have to be so thorough that the patient is not even allowed to sit up or turn himself in bed. Heart tonics will usually be required at first, and later on the tone of the cardiac muscle can be improved by the Schott method of treatment, which is outlined at the end of the section on *Valvular Disease of the Heart.*

Enlargement with hypertrophy can seldom be regarded as a disease; it is rather the process whereby compensation is restored in valvular disease, or by which the heart meets any excessive calls which are made upon it. A hypertrophied heart may therefore be expected in athletes or persons who have constant severe physical work to perform, in people with valvular disease, and in people with high blood-pressure from Bright's disease, arterial disease, &c. There is always a tendency for a hypertrophied heart muscle to undergo degenerative changes in later life, and then all the symptoms of loss of compensation as in valvular disease come on. This is why so many people who have gone in largely for athletics in their youth have heart troubles in later life, especially if they cease to take exercise. The only way to prevent these changes occurring is for the individual to keep up his habit of taking a moderate amount of exercise, and not to make too much call upon the heart and blood-vessels with tobacco, food, and drink. If the symptoms of degeneration come on, the tone will have to be recovered, as far as may be, by graduated exercises, more or less on the Schott-Nauheim plan.

Fatty Heart.—This may mean either *fatty infiltration* or *fatty degeneration.* The former is an increase of the fat around the heart, with spread of it in between the fibres of the heart muscle. It is always associated with general obesity. There are no specially characteristic symptoms, but the condition may always be suspected in fat people who are breathless, especially on climbing stairs, and who have a rather feeble pulse. The treatment is practically that for general obesity (see OBESITY)—a limited diet, with, in particular, very little fatty, starchy, or sugary foods, and very little fluids. Regular exercise must also be taken. If not too far advanced it is quite amenable to treatment.

Fatty degeneration of the heart muscle is a much more serious condition. It may occur in wasting diseases, old age, severe anæmia, or in hypertrophied heart muscle. The symptoms again are not very definite, but, generally speaking, are those of feeble circulation, palpitation, tendency to fainting, and giddiness. The outlook is not very hopeful for recovery from this condition. The patient will have to lead a life of more or less complete rest. Cardiac tonics must be used very cautiously here. To use them in full strength is like whipping up a broken-down horse; it may get a move on for a little bit, but is just as likely to lead to complete exhaustion and breakdown.

(See also ANGINA PECTORIS and PALPITATION.)

Heartburn.—A burning feeling extending up from the stomach through the chest to the mouth. It is due to the regurgitation of acid fluid from the stomach up the gullet, and is sometimes accompanied by mouthfuls of this fluid actually reaching the mouth. For the treatment see under DYSPEPSIA.

Heat Apoplexy or Heat-stroke.—See SUNSTROKE.

Hemianæsthesia.—Loss of the sensation of touch down one side of the body. This sometimes accompanies hemiplegia, or paralysis of one side of the body, but may also be a manifestation of hysteria. (See PARALYSIS and HYSTERIA.)

Hemianopia (or *Hemianopsia*, or *Hemiopia*) means half-vision. A person with this condition sees things only from the middle line to one side—he is blind to everything on the other side; or, in rarer cases, he may see things in front of him, but not out to either side; or, still more rarely, may see things at either side, but not straight in front. The condition is always indicative of some brain disease, and, if present, is very valuable as a means of localising the exact part inside the skull which is affected.

Hemicrania.—Headache limited to one side of the head. It is usually a "sick-headache." (See MIGRAINE.)

Hemiplegia.—Paralysis of one side of the body. (See PARALYSIS.)

Hernia.—This term, in its widest sense, means the protrusion of an organ through the wall of the cavity of the body containing it, and may thus be used, for instance, in speaking of a protrusion of the brain through an opening in the skull. As commonly used—as equivalent to "rupture"—it means the protrusion of some of the abdominal contents, usually a loop of bowel, through some part of the wall of the abdomen. The commonest situation for a hernia to occur is the groin, where two varieties are found. These are referred to later. After that in frequency comes the navel. The characteristic feature whereby a hernia can be recognised is the presence, in one of these (or, more rarely, in some other) situations, of a rounded swelling, which increases in size when the patient stands, coughs, or strains. If the hernia is *reducible*, the contents slip back into the abdomen when the patient lies down, with, perhaps, the aid of a little pressure over the hernia, and so the swelling disappears. If a loop of bowel forms the contents of the hernia, the slipping back is often accompanied by a little gurgle. On standing up again, or on coughing, the hernia "comes down" again, the swelling reappearing. Even if the hernia does not come far down, a distinct wave-like impulse will be felt if the hand is laid over the swelling and the patient gives a cough. An *irreducible* hernia is one in which the contents cannot be returned to the abdomen. This may be because they have become adherent in their new surroundings, or for some other reason.

Two factors are concerned in the production of a hernia: firstly, some defect or weakness in the abdominal wall; and, secondly, some increase of pressure within the abdomen. The weak spots in the wall through which a hernia may occur are as follows: (*a*) The inguinal canal, through which one gets an *inguinal hernia*, the commonest of all forms. In the male the testicle develops at first inside the abdomen, just below the kidney, but some little time before birth it descends into the scrotum, passing obliquely through the abdominal wall, from a point about the middle of the groove between the thigh and the abdomen. This path which it makes is called the inguinal canal. Should this not close properly behind it, as not infrequently happens, a hernia may be present at birth, or occur within a short time after birth. Herniæ are also apt to develop in this situation in grown men, because this always remains a weak spot in the wall, owing to the presence of the blood-vessels to the testicles and the spermatic cord which carries the semen from them. An analogous canal exists in the female, into which passes a ligament which serves to keep the womb in place, but inguinal hernia is very rare in females. (*b*) The crural canal, where the main blood-vessels to the leg pass out of the abdomen. Hernia through this is called *femoral hernia*, and this form is commoner in women than men. The swelling in this instance also appears in the groin, but rather further down on the front of the thigh than in the case of inguinal hernia, and not passing towards the inner side of the thigh. (*c*) At the *umbilicus*, or navel. This is apt to be a weak spot in poorly-developed or poorly-nourished infants, and to be the site of a hernia. (*d*) A *ventral hernia* may occur through other parts of the front of the abdomen—*e.g.* in the middle line below the navel, especially in women who have had many pregnancies, or at any part where there is the scar of an operation or other wound. There are other sites where herniæ may occur, but, giving rise to no visible swelling, their presence is only suspected, perhaps, when strangulation (see below) occurs, and the patient develops the symptoms of intestinal obstruction. (See INTESTINES, DISEASES OF THE.)

With regard to the second factor, the increase in intra-abdominal pressure, the following are the conditions which bring this about. In baby boys excessive crying is usually blamed, but, while it is admitted that the crying may be the immediate cause of the hernia coming down, it is equally certain that, in the great majority of cases, the canal is there ready for a hernia to occur, and that, sooner or later, crying or no crying, in these children an inguinal hernia is practically bound to occur. Laborious occupations and heavy weight-lifting in particular are probably the chief cause in adults; this explains why hernia is so much commoner in men than in women. Chronic coughing or frequent straining at stool may also be responsible, while in women repeated child-bearing and emaciation are probably the most important factors.

The symptoms of hernia, apart from the mere presence of the swelling, are few. Sometimes, but only rarely, the hernia develops suddenly during some strain, the person being conscious of something giving way. As a rule they grow gradually, and may attract attention first through a sense of weight or drag. When they become irreducible, they are likely to be accompanied by more or less dyspepsia and constipation. The great danger about herniæ, especially inguinal and femoral ones, is that *strangulation* may occur at any time. This means that the circulation of the contents of the hernial sac is obstructed at the point where they pass through the abdominal wall. If not quickly relieved, this means that these parts turn gangrenous, and that in all likelihood general peritonitis and death will follow. The symptoms of strangulation are practically those of intestinal obstruction, the outstanding features being great pain and tenderness in the hernia, complete stoppage of the bowels, vomiting, and collapse. Strangulation is only likely to occur in cases of hernia of old standing, generally irreducible.

Treatment.—1. *Preventive.* But little can be said on this point. In infants, while it is, no doubt, advisable to keep the abdomen tightly swathed for some little time after birth, and, from every point of view, to have them crying as little as possible, it is very doubtful whether any amount of care will prevent the formation of a hernia should Nature have failed to close the weak spots at the navel and the inguinal canal properly; whereas it is equally doubtful if any amount of crying will produce a hernia if these parts are formed perfectly. To advise no laborious work or lifting of heavy weights is, no doubt, a counsel of perfection, but it is scarcely practical. Constipation, however, may be avoided, and even the ill-effects of straining at stool can be, to a large extent, counteracted if people would but "go back to Nature" and adopt the squatting posture for moving the bowels. In this attitude the thighs are brought up against the abdominal wall, and support it, while the openings of the inguinal and crural canals are almost impossible to force in this position. After confinements and abdominal operations, support for the abdominal wall by means of binders or belts is necessary for some considerable time.

2. *Palliative.*—This only applies to reducible herniæ, and consists in preventing the hernia from coming down by means of a properly-fitting truss. To be of any real value the truss must keep the hernia up under all conditions, for, if it comes down behind the truss, the patient is in more danger of strangulation than if none were worn. It is therefore all-important to get trusses which fit properly. In infants and children a truss may also be curative, provided that it is worn constantly, and that the hernia is never once allowed to come down. If it does, then all the good of the previous wearing is undone. The chances of it being curative, however, are small, and only too often, even when cure apparently follows, the hernia recurs when the child grows up. A simple truss for use in young children may be made from a skein of worsted. Make a long loop at one end, place this over the hernia, carry the other end up in front of the opposite thigh, round the waist behind, down in front, through the loop, and between the legs, pinning or tying it to the circular part behind the back. For older patients three trusses are really necessary—one to wear during the day, one with a lighter spring and pad to wear at night, and one made of rubber or celluloid to wear in the bath, where there is a special tendency for the hernia to come down. For femoral, umbilical, and ventral herniæ trusses of different pattern are required, but the principles of application are the same.

3. *Curative.*—This means operative treatment, for there is no other means of cure. Considering the practicably negligible risks of operation as contrasted with the ever-present risk of strangulation, with the necessity, perhaps, of operation under very unfavourable circumstances, and the disabilities which the presence of a hernia puts on one with regard to the public services, in connection with insurance, &c., we would say that an operation for the radical cure is advisable in the vast majority of cases. It is not recommended in persons over sixty or in very stout people with irreducible herniæ, and perhaps children with very small hernia might first be given the chance of a cure by a truss. On the other hand, it should be remembered that the operation in children (after weaning) is very simple, and practically invariably successful, whereas in adults it means a rather bigger operation and more time, which perhaps can be less well spared, and there is always a small percentage of cases in which the hernia will recur.

The particular operation employed will depend on the nature of the particular case, and must, of course, be left to the discretion of the surgeon. Should a person with a hernia develop symptoms indicative of strangulation, medical aid must be obtained at once, because immediate operation is necessary if the patient's life is to be saved. In the meantime the patient may be put into a hot bath, and gentle rubbing over the hernia employed. Occasionally, but not very often, the constriction may be relaxed in this way, and the contents of the hernial sac reduced back into the abdomen. Repeated or forcible attempts at reduction of the hernia must not be tried, as great damage to the inflamed bowel may be done. Even if these attempts at reduction fail, the patient will have been rendered more comfortable while in the hot bath, which is always some good accomplished.

Herpes.—See Shingles.

Hiccough is due to a sudden violent contraction of the diaphragm, and may be caused by irritation in the neighbourhood of this muscle, or reflexly from a distance. An attack of hiccough may last a few minutes, or, in severe cases, hours or even days, or it may tend to recur at intervals over a long period. It is most commonly a symptom of dyspepsia, especially of the acid type, and may be associated with heartburn. It may also be due to more serious affection of the stomach, such as cancer, or to diseases of the liver. It is also apt to occur in typhoid fever, and may be set up reflexly in diseases of the nervous system, such as meningitis or brain tumours. Hysteria or any violent emotion or mental shock may set up hiccough; they may also stop it when present—a fact which is sometimes made use of by giving a person with hiccough a fright. It may also occur as a complication of pregnancy, Addison's disease, and exophthalmic goitre. If none of these causes can be found in any particular case, then in all probability it will be an irregular manifestation of gout. When it comes on severely in a person who is seriously ill, it is always a serious omen.

Treatment.—In slight cases, full expiration and stoppage of breathing for as long as possible may stop it. A teaspoonful of peppermint water in dyspeptic hiccough is often the quickest cure. Pulling out of the tongue may also be tried. The application of a mustard-leaf over the pit of the stomach may be tried in more severe cases; but if the hiccough becomes at all persistent, the advice of a doctor should be obtained. In bad cases, various internal remedies may have to be tried. No single one is successful in all cases, but probably the most generally useful is nitroglycerine, in doses of about one-hundredth of a grain.

Hill-diarrhœa.—See SPRUE.

High Shoulder.—See SPINE, DISEASES OF THE.

Hip-joint Disease.—What is usually known as "hip-joint disease" is tubercular disease of the hip-joint. This does not differ in any essential manner from tubercular disease affecting any other joint. The chief symptoms are stiffness of the hip, some abnormal attitude of the limb, lameness, wasting of the muscles about the hip and leg, pain, and swelling. These are arranged in order of prominence; children and young persons are affected chiefly. The general principles of treatment are the same as those described under TUBERCULOSIS, and ABSCESS, CHRONIC.

Congenital dislocation of the hip is referred to under DEFORMITIES. The hip-joint may also be the seat of rheumatic or rheumatoid affections, like any other joint. See JOINTS, DISEASES OF THE; RHEUMATISM; and RHEUMATOID ARTHRITIS.)

Hives.—This is a term applied rather vaguely to diseases of children. Practically any affection of children about which mothers, especially of the poorer classes, are uncertain, or do not in the least know what it is, may be called hives. If the word has any definite application at all, it is either to nettle-rash or else diarrhœa. (See DIARRHŒA and NETTLE-RASH.)

Hodgkin's Disease, or *Lymphadenoma,* is a disease in which the lymphatic glands all over the body become enlarged. Those in the neck, for instance, may form large nodular masses at the side of the neck. Tissue like that of lymphatic glands in structure also becomes deposited in various organs of the body. The cause of the condition is not known. Along with the progressive enlargement of the glands the patient becomes gradually anæmic, and weaker and weaker. There is no known treatment which has any certain effect in stopping the progress of the disease. (See under GLANDS, DISEASES OF THE.)

Hordeolum.—See *Stye,* under EYES, DISEASES OF THE.

Housemaid's Knee.—See BURSITIS.

Humpback.—This is usually the result of tubercular disease of the bodies of the vertebræ of the spine. (See under SPINE, DISEASES OF.)

Hydatids, *Hydatid Cyst,* or *Hydatid Disease.*—See under PARASITES.

Hydrocele.—See under TESTICLES and SCROTUM, DISEASES OF THE.

Hydrocephalus, or *Water on the Head.*—See under BRAIN, DISEASES OF THE.

Hydrophobia, or *Rabies,* is a disease occasionally communicated to man through the bite of dogs, wolves, or, more rarely, of cats, foxes, &c. The disease gets its name of hydrophobia ("fear of water") because, when it is thoroughly developed, the patient has violent spasms of the muscles, and especially of those concerned in swallowing. When the patient attempts to swallow saliva or water, these muscles go into violent spasm, and the fluid is forcibly ejected; the spasm of the muscles at the entrance of the windpipe also gives rise to a sound resembling a bark.

The disease rabies in carnivora affects them by rendering them "mad," or else paralysed. It is conveyed from them to other animals, such as cattle or horses, or to man, through the saliva of the affected creature, the virus of the disease being present in the saliva. The certainty of inoculation depends much on whether the bite is on an exposed part of the skin, or whether much of the infective saliva is wiped off on the clothes. A lacerated wound resulting from the bite of a rabid animal is most likely to be followed by hydrophobia. It is a curious fact that the bite of affected wolves or cats is more dangerous than that of the dog, the animal with which we usually associate the disease.

The symptoms do not come on till some considerable time after the bite. Six weeks is about the usual period; ten days is the shortest period on record; but, on the other hand, the onset of symptoms may be delayed for six or eight months. The site of the bite, which will probably have long healed, begins to look red and irritable; the patient feels uneasy and depressed, and has a vague sense of fear. After a few days the depression gives way to excitement, wildness, and terror. The muscular spasms or convulsions come on, being started off by any bright light or sound, and the characteristic difficulty in swallowing appears. There is considerable fever attending this stage, which lasts a few days and is very distressing to witness. The patient then becomes paralysed and comatose, and death comes as a merciful release. The mind usually remains clear until near the end.

Treatment.—This ought to be preventive, by strict muzzling regulations and the destruction of all affected animals, or animals bitten by, or coming in contact with, rabid animals. Since the enforcement of the Muzzling Order, hydrophobia has been banished from this country, no case having occurred from the bite of an animal in Great Britain for a number of years. This ought to be sufficient answer to those ultra-sensitive persons who have not yet ceased to denounce the cruelty of the Muzzling Order, but apparently it is not. What is to be done with the type of mind which considers the comfort of the canine race as much more important than the lives of their own fellow-creatures? If a mad dog appears, people should hold up their hands; there is much less danger from bites through the clothes.

When a person is bitten by an animal possibly rabid, a ligature should at once be put on tightly above the wound, if it is on a limb, so as to prevent the poison being absorbed into the system. Tie a piece of thick cord or handkerchief loosely round the limb; slip a knife, pencil, or piece of wood under it, and twist so as to tighten it up firmly, and keep it thus tight in position. The wound itself, whether on a limb or on the trunk, should be cauterised, or burnt out, with a hot iron. If this cannot be done at the time, the wound should be vigorously sucked, provided that there is no abrasion in the mouth—care being taken, it is hardly necessary to state, to spit out all the matter which is sucked from the wound, and to cleanse the mouth with some antiseptic lotion as soon as possible. It is desirable that the offending animal should not be killed at once, unless it is quite certainly "mad." If there be any doubt it should be kept alive, carefully isolated, for a week, by which time symptoms will have definitely developed or not. Should it have been killed, the injection of a part of its brain (the medulla preferably) into the brain of a rabbit will settle the question by the rabbit developing rabies or not within two or three weeks. All this is of importance, on account of the long period which may elapse in the human subject before symptoms develop, during which period the uncertainty will be very trying. Should there be any real doubt, however, as to whether the animal who bit the individual is suffering from rabies, it is better not to wait for any such proof, but to get Pasteur's immunisation treatment commenced at once, as, for this to be successful, it should be begun within a week of the bite. The essence of this measure consists in inoculating the patient with an emulsion of the spinal cord of rabbits which have been killed with rabies, the cords having been dried until they have lost so much of their virulence. Stronger and stronger emulsions are gradually employed, until the patient becomes immune to the full strength of the virus. From two to three weeks' treatment are required. It does not always succeed, especially if some time has elapsed between the bite and the commencement of treatment, but thousands of lives have undoubtedly been saved by this method. There are Pasteur institutes where the treatment can be carried out in most countries now; in India, for instance, some thousands of cases are treated annually. The treatment is not one which could be undergone by a conscientious anti-vivisector, of course. If he or she considers his life of less importance than that of some rabbits, well and good; but if it comes to withholding the treatment from others, perhaps children, who are very susceptible to the disease, we must protest strongly, for there is no other treatment which has the least influence in staying the progress of the disease, and it causes intense agony and is exceedingly distressing to see. Chloroform, morphia, or other sedatives are the only measures which lessen the severity of the spasms once they have developed.

Hyperpyrexia means excessive fever. (See Fever.)

Hypermetropia, or *Long-sight.*—See under Eyes, Diseases of the—*Errors of Refraction.*

Hypochondriasis may be defined as a state of mental depression in an individual owing to his belief that he has some disease. It is not an insane condition, although it borders on melancholia, and may pass into definite insane melancholia. It is generally a disease of later life, especially of well-to-do city people with no work to occupy their attention. As a rule their ailments are referred to the alimentary system, their stomach, or their liver, and there may really be some little trouble, but its importance and the amount of attention which the sufferer gives to it are grossly disproportionate. Hypochondriacs are a fertile source of revenue to doctors, as they go round them all with long, elaborate accounts of their symptoms and sufferings, but are seldom long satisfied with the ministrations of any particular one. Their whole life is centred on their trouble; they live for it and nothing else, and, to a certain extent, are even happy in their misery. It is no use a medical man pooh-poohing such an individual's woes and telling him in a breezy way that there is nothing the matter with him; he only gets called an ignorant fool or an unsympathetic brute, and his patient moves on to some one else. The best thing that can happen for such a person is that some real trouble should come his way; this *may* "break" him, but, on the other hand, it is the most likely thing to "make" him, if he is capable of being made at all, by taking his thoughts off himself and forcing him to bend his energies to some other purpose. Since such blessings in disguise cannot always be arranged for, the next best thing is that the melancholic shall fall into the hands of some one in whom he has confidence, who will thoroughly examine him from head to toe, and earnestly assure him that there is no physical basis for his aches and pains. But, since the idea of being ill has become more or less a fixed one, it will be necessary for the patient to be reassured of this again and again and again. The effort has to be made to get the patient's mind occupied with some other ideas; they must be made, somehow or other, to take regular exercise and work, and they must be kept off reading medical works and worrying about their symptoms. Naturally, of course, any dyspepsia or other little trouble which there may be, must be treated. Sometimes a little judicious deception has to be practised at first, as bluntly telling the patient that there is nothing the matter with him, but only a fixed idea that something is wrong, is not always the best way to gain their confidence. The truth has often to be allowed to dawn gradually upon them. It will be readily seen that the management of these cases is by no means easy. The personality of the doctor counts for a great deal, and it is often tact that does more than profound knowledge in managing such cases.

Hysteria.—This is a condition about which it is very difficult to give a proper conception. The popular idea of a hysterical person is one who is very emotional and excitable, and liable to go into "hysterics" from little or no provocation. While this idea is, in the main, true, it by no means includes all the possibilities of hysteria, and a considerably wider conception of the disease is necessary. Underlying hysteria there is a nervous constitutional state of mind, weakening the patient's powers of inhibition and self-control. The state of mind is one which is open to, and exceedingly liable to be, influenced by ideas and suggestions of all sorts and from any source. This openness to suggestion leads the hysteric into many curious departures from normal behaviour, and to the conscious or sub-conscious imitation of various diseases. It is wrong to think that the symptoms are deliberately produced from a sort of ill-natured disposition, because the patient really cannot help having them. The view of the patient is that she *cannot* help doing certain things, that of the friends that she *will not*, while the truth is that she cannot will not to.

The causes of hysteria are also very varied. To begin with, racial characteristics play a certain part; Jews are perhaps the most hysteric of races, the Latin and Slavonic races coming next. Among the Anglo-Saxon peoples the American are more hysteric than the English, and the English more than the Scots. With regard to sex, in England it is about twenty times as common in women as in men, whereas in France there is one male hysteric for every three females. It is commoner in boys about the time of puberty than in grown men. Hysterical symptoms usually make their appearance between the ages of ten and twenty-five, but they have been noted even in infants three months old. Hereditary influences play a great part in the production of hysteria, the parents being either themselves hysterics, or, on one or both sides, nervous, epileptic, insane, alcoholic, or debilitated from some long-lasting disease such as tuberculosis or syphilis. Intermarriage is probably also often a factor of considerable importance. Faulty upbringing and education play a large part also in the production of a hysterical constitution. A child who has never been properly controlled is very apt, about the time of puberty, to show hysterical tendencies. The immediate exciting cause of an attack of hysteria is frequently some emotional strain, such as a fright, worry, or the fear of a school examination, a love affair, or, it may be, an attack of bodily ill-health, or an accident of some sort. The influence of suggestion and imitation is often seen in boarding-schools, workhouses, religious institutions, &c., one hysterical case under such conditions starting off a regular epidemic of them among the inmates. Hysteria used to be thought to be due to disturbances in the genital organs, the very name being derived from the Greek word for the womb, but this is no longer thought to be the case. There may certainly be symptoms connected with these organs, but they are a result, not the cause. Before going on to describe the main symptoms and characteristics of hysteria, it should be said that the recognition of hysteria is often the most difficult problem that even a specialist on nervous disease has to tackle. Some cases with typical hysterical seizures may be easy enough to recognise, but at other times the general behaviour of the patient may not be at all suggestive of hysteria, but the symptoms may be so closely imitative of some other disease that only the most careful and thorough examination will reveal the fact that the disease is, as it is termed, "functional," and not "organic"—that is to say, that it is due merely to disordered action of the nervous system, and not to any real gross structural or organic disease. The mistake is very often made of regarding what are purely hysterical symptoms as due to organic disease, and the treatment which may be appropriate enough for the latter condition has the effect merely of confirming and accentuating the symptoms if they are really hysterical. On the other hand, the opposite mistake may be made—viz. of regarding as hysterical symptoms which are due to gross disease. In certain conditions—disseminated sclerosis, a disease of the nervous system, may be cited as one prominent example—there is often a functional or hysterical element superadded to the organic disease, and, if the latter be overlooked, grave harm may be done to the patient by labelling her and treating her simply as hysterical.

We shall first describe the mental characteristics of hysteria. In the first place, there is always deficient self-control. Hysterical subjects are apt to be very emotional, passing readily from laughter to tears, &c., impulsive, irritable, self-conscious, and always posing. They are childlike in their outbursts of temper, and easily dominated by all sorts of ideas; thus, if they think they are going to have pain, they will have pain; if they think they are going to have a baby, the abdomen will gradually swell, &c. Various other symptoms which are due to this openness to suggestion are retailed below. How the tissues and organs respond to the ideas is not clear, but certain it is that no disease illustrates so well the power of mind over matter. An intense love of sympathy seems to colour much of the actions of hysterics; ailments are manufactured more or less consciously, but certainly uncontrollably, to get this sympathy, and there is little or no respect shown for the truth in order to obtain it. Religious excitement is not infrequently evidenced by hysterical subjects, and the wild waves of revivalism which sweep the country occasionally are largely of this nature. Curiously enough, just as in the case of religious mania in the actually insane, there is often a weird mixing up of religious and sexual emotions.

Hysterical seizures or fits are probably the most striking and characteristic feature of hysteria, but they only occur in a comparatively small proportion of cases—in "les grands hystériques," as the French call them, or hystero-epileptics, as they have sometimes been termed, although that is a bad name, as they are not epileptic at all, although the severity of the fit suggests epilepsy. In such attacks the patient may fall to the ground with a scream, but she takes care not to hurt herself. She throws herself about irregularly, not after the definite type of epileptic attacks, and all sorts of passionate attitudes may be indulged in. She does not bite herself, although onlookers may be bitten, and the urine is not passed involuntarily as in epilepsy. Foaming at the mouth may be seen, but, if so, it has been provided for by the use of soap or some other material. Cataleptic conditions or trances may form part of these attacks. It is noteworthy that these attacks never occur except in presence of an audience, but, given an audience, they may go on for an almost indefinite time if sufficient sympathy is shown. Being left severely alone, or treated with, or with the threat of, a jugful of cold water, usually brings them to a quick termination. Pressure on certain areas of the body, such as under the breasts or over the ovaries, will often bring on such attacks, particularly in a patient on whom this has been tried before, or who, somehow or other, has become aware of this fact. Similar pressure will in some instances also stop the attacks. By the exercise of a little will-power these attacks may often be prevented from occurring, but, once they have started, it seems often to be quite beyond the patient's powers to keep them under any sort of control.

Disturbances of sensation are very common in hysteria, but the power of suggestion must be remembered in this connection, as, indeed, with all hysterical symptoms, lest the method of examination or an unwary remark may suggest the symptom to the individual. Of course, parenthetically, it may be said that this is sometimes deliberately resorted to for purposes of diagnosis—suggest some symptom, a rather absurd one perhaps, to the patient in a manner not too obvious, and it will often be found that she falls into the trap and the symptom develops. Complete loss of sensation over parts of the body, or of a whole half of the body, is common. Needles may be stuck into such a patient's skin without their being felt. Joints or other parts of the body may, on the other hand, be hypersensitive, the parts looking as if they were inflamed or diseased. The pains may be described as of excruciating severity, although the general attitude of the patient is not always in keeping with this. The special senses may be likewise affected, patients becoming blind or deaf, &c., or with some affection of vision.

All kinds of *paralyses*, *spasms*, and *tremors* may occur in hysteria. They may come on suddenly or gradually; paralysis may last for years, and even produce marked contractures in limbs. One of the commonest forms of paralysis is that of the vocal cords, so that the voice is lost or reduced to a whisper.

In the other systems of the body there may be such symptoms as spasm in the gullet, giving rise to the feeling of a ball in the throat, which is very commonly complained of; complete loss of appetite and (pretended) taking of no food; vomiting; hiccough; mysterious rumblings in the stomach; diarrhœa even; palpitation; hard, barking cough, very annoying to those around, but not particularly so to the patient; the appearance of flushed or congested areas on the skin, or even hæmorrhages under the skin, when the mind has been dwelling particularly on such parts. There is never dribbling of urine, but there is not uncommonly inability to pass any, which may either be real or put on to induce doctors (of the opposite sex) to pass instruments. In other cases there is even no urine secreted by the kidneys for days on end, the patient being apparently none the worse. Sexual irritability and troubles with the generative organs are not uncommon. It will be seen from this description of the symptoms that the diagnosis of hysteria is not always by any means easy, from definite organic disease on the one hand and from malingering on the other.

Treatment.—The measures directed towards preventing the development of hysteria in those predisposed are best enforced by the parents or those in charge of children during their early years. Nervous mothers themselves should avoid speaking of their complaints before their children; they should not show too much concern when there is anything wrong with the child; and especially should they avoid making too much of the child's every complaint, no matter how trivial. Such children should be taught self-control and restraint; it is often necessary to prevent them from dwelling too much on any one subject, no matter how right and proper that subject may be. They should have variety in their work, both physical and mental, and also in their play, but too much excitement and amusements are very much to be deprecated. All precociousness should be nipped in the bud, and the child made to live a healthy out-of-door animal life, rather than be allowed to "frowst" indoors, reading silly, imaginative stories, or indulging in too many day-dreams. Removal of a child from the home circle is sometimes advisable, not only for its own sake, but to prevent other members of a susceptible family from falling victims by imitation.

With regard to the treatment of actual hysteria, the following may be said—that all hysterical symptoms and manifestations are curable, but the hysterical constitution itself is not, so that under suitable conditions there is always a tendency for the symptoms to recur either in the same or different form. For the successful management of hysterical cases a proper conception of the disease is the first necessity; that is why we have gone so fully into that part of the description. It must be clearly understood that it is the mind which requires treatment, although the condition is quite different from mental disease or insanity, so that, although due regard must be paid to the physical condition of the patient, and bodily symptoms properly treated, the main efforts must be directed towards the mental state of the patient if anything like a cure is to be effected. It is quite useless to attempt simply to reason or argue such patients out of their symptoms, or to ridicule them, or to give them to understand that they are regarded as impostors who could prevent their symptoms if so inclined. It must be made clear to the hysteric, by whoever undertakes their cure, that their condition is clearly understood and recognised as due to disease (this, of course, does not mean that they are to be told abruptly, "Oh yes, it is hysteria you are suffering from; I know all about that, and can soon put you right"); but, on the other hand, it has also to be made clear to them that there is nothing very wonderful about their malady, as they are prone to imagine and rather plume themselves on; that many other people are similarly affected; and, above all, that the condition is one from which they *will* (not merely *can*) make a complete recovery. Given this proper understanding of the nature of the malady on the part of the healer, and faith on the part of the patient, apparent miracles can be worked. It hardly matters who undertakes the cure, or what the means employed are; if these two requisites are there, the blind may be made to see, the deaf to hear, and the paralysed to walk. The key to the situation is the power of suggestion; just as this may produce any symptom, so can it remove any one. Half-measures in treatment usually fail, and it is seldom advisable for treatment to be attempted in the patient's own home. They must be removed from the excess of sympathy which is usually meted out to them there, to some place where they are not fussed over, and their illness is treated in a firm, matter-of-fact way. In a case which is at all severe there should be complete isolation for at least six weeks, with no seeing of friends and no writing or receiving of letters. Over-feeding and massage on the same lines as is used for a rest-cure in a nervous breakdown (see NEURASTHENIA) are very often necessary, as the general physical condition of such cases is usually much below par. The whole plan of treatment, including the diet, is made as dull and monotonous as possible, intentionally, to tire the patient of it and make her wish to get well again. Restrictions may be removed one by one as improvement occurs, and the removal of these may be held out as an incentive, but any relapse must be the sign for enforcing the restrictions again. Various remedies, such as drugs or physical measures, will be employed to treat whatever special symptoms may be present. It must be repeatedly impressed upon the patient how much better she is getting, and the very idea of invalidism pushed into the background. As improvement occurs she may be gradually enlightened into the true nature of the malady, and how the symptoms may be prevented. These, briefly, are the principles to be followed in trying to build up the patient's powers of self-control, for that is what treatment amounts to. A word might be said about hypnotism as a method of treatment in hysteria. It is undoubtedly a very powerful agent, as the influence of suggestion may be so much stronger in the hypnotic state, and symptoms may be very quickly removed by it. There is this great drawback, however, that, instead of strengthening the patient's will-power, it rather weakens it, and renders her still more dependent on outside influence, so that it is rarely a measure which can be recommended. The slower and less showy method of suggestion in the waking state, combined with mental and moral strengthening of the patient's will, is much to be preferred, and is likely to be more stable. Drugs play but a small part in the treatment of hysteria, although general tonics may be useful, and also certain drugs which have a very nasty taste, and probably act through the moral effect which this produces. It is advisable that a hysterical subject should, somehow or other, have her time fully occupied in a useful pursuit, so as not to leave time for vapourings about herself.

For an actual hysterical fit, either leave the patient alone, or give her a douche of cold water and strict orders (heard by the patient) that the next attack must be treated by a cold bath, or the fit can often be brought to a termination by producing a state of temporary asphyxia by holding a towel over the mouth and nostrils; the patient must stop to breathe.

Ichthyosis.—See under SKIN DISEASES.

Idiocy.—Idiocy and imbecility are terms applied almost indifferently to any case of mental enfeeblement or deficiency in children, although imbecility is usually taken to mean a less severe enfeeblement than idiocy. These conditions are usually due to some arrested or imperfect brain development, occasionally to some injury received during birth. The degree of mental backwardness varies very considerably; in some instances it merely amounts to the individual being slightly "soft" or silly, in other cases it may be so pronounced as to render the child quite incapable of being educated at all. Sometimes the physical condition may be perfect, but more commonly it is also defective, and imbecile children are more likely than not to die young. The condition may be said to be always incurable, but, on the other hand, there are few mentally defective children who are not capable of considerable improvement under suitable conditions. For the first five or six years of life mentally defective children are best kept at home. Their general health must be very carefully looked after; they should, in particular, be as much as possible in the fresh air, and get plenty of milk, eggs, &c., as they are always liable to contract consumption. Any evidence of cretinism or epilepsy (see these conditions) indicates special treatment required. The child's bodily and mental faculties should be awakened and trained as much as possible by the teaching of simple exercises, and encouragement in noticing things and in doing things for itself. Teaching of self-control and training of the moral faculties is very difficult, and requires great patience and perseverance on the part of the mother; but only the very lowest grades of idiots will fail to respond in some degree if the training is consistently carried out. If the child is at all educable, institution training is advisable in most cases after the age of about six. Here the child will be free from the teazing of normal children and the demoralising effect of seeing itself always behind other children, whereas amongst others about its own level the child will not only be happier, but can be trained up much better and more easily to become, as far as may be, a useful member of society.

Imbecility.—See IDIOCY.

Impetigo.—See under SKIN DISEASES.

Impotence.—This is not a disease in itself, but a symptom, although not a very common one, which may arise from various causes. The commonest is probably a general neurasthenic or run-down condition, and this form is to be regarded as temporary, and can be quite well recovered from without any special treatment beyond that generally applicable to neurasthenia. (See NEURASTHENIA.) We would just like to add a word of warning not to be terrified by the fearfully overdrawn pictures drawn in a certain class of advertisements regarding the evils attending loss of virility, manhood, &c., and attributing all this to disease of the genital organs and only to be cured by the use of the advertiser's nostrum. The condition is, in the great majority of instances, not a local disease at all, and is in no sense itself the cause of the other symptoms, but is simply one amongst them. In other cases the condition may be due to obvious disease of the organs of procreation (see SCROTUM and TESTICLES, DISEASES

OF THE), or to affections of the spinal cord, such as injuries, locomotor ataxia, or other nervous diseases. If a person is in any doubt about this trouble, it is far better to consult a reputable medical man than to get into the hands of some advertising quack, who will simply bleed him for all he is worth. (See also STERILITY.)

Incontinence is the term applied to inability to retain the contents of the bladder or of the bowels. The condition may be due to disease of the parts concerned, or to disturbance of the nervous mechanism controlling these actions, from disease or injury of the spinal cord, &c. (See under BLADDER, DISEASES OF THE.) For incontinence of fæces from the bowels little can be done beyond careful nursing and keeping as clean as possible.

Indigestion.—See DYSPEPSIA.

Infantile Paralysis.—See PARALYSIS.

Inflammation.—This may be defined as the reaction on the part of the tissues of the body to any irritant. Practically speaking, in the great majority of instances this means the reaction to the invasion of the body by bacteria or germs of some sort. Since a large number of diseases which are described separately throughout this section of the book come within this definition of inflammation, it is not necessary here to describe more than the general features more or less common to all forms of inflammation. The details vary considerably, depending on such factors as the peculiar nature and habits of the special responsible germ, the virulence of the particular strain of that germ, the number of germs which invade the body at the start, the healthiness and power of resistance or otherwise of the individual, and the particular tissue or part of the body attacked. The four cardinal symptoms which have been recognised as the main symptoms of inflammation since very ancient times, long before its true nature was understood, are redness, heat, swelling, and pain. These symptoms may not all be apparent, of course, when a deep-seated portion of the body, such as the lungs, the interior of the bowels, or the meninges covering the brain, are the seat of the inflammation, but they are obvious enough when a more superficial part is affected, such as, for instance, an abscess forming in the finger, or a gumboil. When germs get past Nature's first line of defence—the unbroken and healthy skin and membranes lining the passages, such as the nose, mouth, bowel, &c.—either through a breach of continuity (scratch, wound, &c.), lowered vitality, or presence of very virulent organisms, the first thing that happens is a dilatation of the blood-vessels of the part, and an increased flow of blood, which accounts for the redness and heat. The white blood corpuscles then pass out through the capillary walls in large numbers, along with a considerable amount of the fluid portion of the blood. This bathing of the infected tissues explains the swelling, while the rôle of the white corpuscles is that of policemen or scavengers attacking, and, if possible, completely destroying and clearing away, the invading germs. They constitute the second line of defence. They also remove tissues which have been killed or damaged by the action of the germs, and later on help in the repair of the damaged part. These white corpuscles may either find their way back again into the circulation, or, if large numbers have been poured out in response to the invasion, and many have died fighting the germs, they accumulate as pus or matter, often forming a definite abscess, which is simply a cavity formed by the destruction of tissue containing this pus. The pain, which is the fourth cardinal symptom, is due to the stretching of the tissues by the fluid and pressure on the nerves in the neighbourhood. Other symptoms common to most forms of inflammation, such as general rise of temperature or feverishness, shivering fits or rigors, sweating, &c., are traceable to the absorption into the circulation of poisonous products or toxins formed by the germs at the site where they have established their presence. These toxins in some instances call forth the formation within the body of antagonistic substances, or antitoxins, which may either neutralise the action of the toxins, or, in some cases, may have a directly destroying action on the germs themselves. This constitutes the third and last line of defence. These antagonistic substances usually confer on the individual a certain amount of immunity against further infection by the particular germ which has called them forth, but the degree of immunity conferred and the time it lasts varies exceedingly; sometimes it is lifelong—as, for instance, with smallpox—in other cases it may be very slight and of short duration, or even non-existent. Various special symptoms will be present when special organs are the seat of the inflammation—as, for instance, in pneumonia, an inflammation of the lungs; meningitis, of the membranes covering the brain; typhoid fever, of the bowels; &c. &c. When mucous membranes are the seat of the inflammation, as in the nose or stomach, there is a great pouring out of mucus, and the condition generally goes by the name of catarrh. The inflammation produced by certain germs, the tubercle bacillus in particular, is, as a rule, a much more chronic process; the outstanding symptoms of inflammation are not so prominent, and, along with the destructive processes, there usually goes hand in hand a considerable amount of repair.

The treatment of inflammation is considered in sufficient detail under the headings of the particular forms of it. The ideal measure is, of course, one which will destroy the germs which are responsible for it, and at the same time not injure the tissues of the body invaded by them. This is what one attempts to do by the use of antiseptics in cleaning wounds, &c.; but, once the germs have actually got into the tissues, and have commenced to multiply there, other methods which reinforce Nature's ones must be adopted, as there is yet to be found the ideal antiseptic, which can be used in strength sufficient to destroy germs effectually without at the same time destroying the body tissues. In the early stages the application of cold by means of an ice-bag is probably the best measure; it acts by preventing the activity of the germs, and thus allowing the natural defences of the body to deal with them. The application is temporarily a little uncomfortable, but very soon this is got over, and relief from the pain and throbbing quickly follows. Later on, heat acts better than cold, producing its effect not by depressing the activities of the germs, but by stimulating the flow of blood to the part, and increasing the activity of the white corpuscles. It should be applied in the form of moist heat, either as a poultice or a fomentation; these also relieve the pain in the inflamed part. Another method sometimes applicable is congestion of the part by means of rubber bandages or by cupping. Other measures which come in useful in certain instances are the direct application of antiseptics, when this can be done; the administration of various internal remedies, which may be either of the nature of tonics or stimulants to the body, or serums, antitoxins, vaccines, &c., which have a direct antagonistic action on the organisms themselves or on their toxins.

Influenza, or La Grippe.—This is a disease which occurs in widespread epidemics, and it is now known to be highly contagious from person to person, the contagion being spread by means of the specific influenza bacillus, which is present in the material coughed up by sufferers from the disease, and thus gets into the atmosphere. The infection is easily caught by coming near a person with influenza, but the germs apparently do not live long when outside the body, so that there is little risk of the infection being spread by clothes or by third parties. The period of incubation—*i.e.* the time between the entrance of the bacillus into the body and the appearance of symptoms—is very variable; it may be four or five days, or it may be as short a period as six hours. The symptoms of influenza are also exceedingly variable, few diseases, in fact, assuming so many different forms. It is usually found, however, that there is a tendency for the type of the disease to be similar in all the sufferers during any particular epidemic. One feature common to all influenzal attacks, no matter what their type, is the lowering of muscular and mental energy, and peculiar readiness to exhaustion, which follows the attack, even though it be quite a slight one. It is this feature which makes influenza such a serious and often dreaded disease. Those who have once had an attack know what it means, and fear another, but those affected for the first time, especially if the attack be slight, are rather apt to treat it with contempt, sometimes with disastrous results. The onset of symptoms is usually sudden, generally with considerable feverishness, sometimes with none. Persons of every age and station in life suffer from influenza. In its commonest form the attack begins with pains in the back, head, and limbs—the whole body, in fact, may be one large ache. It is noteworthy that in the limbs it is the bones or parts between the joints which seem to ache most, not the joints themselves, as in acute rheumatism, with which influenza is sometimes confused at this stage. There is sore throat, with redness and swelling visible about the tonsils and back of the throat, and an irritable, hard, dry cough. The skin is dry and hot, the face lacks lustre, having an earthy appearance and a weary, worn expression, with black rings under the eyes. The patient is often sleepless from the pain. The aching frequently remits on the second day, only to come back on the following one with unabated vigour. The length of the attack varies within wide limits, but it always produces its characteristic feeling of lethargy and general limpness, which may persist for a long time after the acute symptoms have passed off.

In addition to these symptoms, which may be called those of simple influenza, one may have other features, depending on the particular organ or set of organs which the bacilli attack. These further symptoms will usually be in addition to those already mentioned. Thus we have (*a*) the respiratory type, in which the lungs bear the brunt of the infection, there being bronchitis or broncho-pneumonia, with constant cough and abundant thick, frothy spit. Occasionally there is pleurisy, but there is always marked prostration, frequently delirium, and the disease may be fatal, especially in old or feeble individuals. (*b*) In the cardiac type there is a tendency to acute dilatation of the heart, with a rapid and irregular pulse, and great breathlessness and discomfort. This may be rapidly recovered from, but the tendency is rather for the breathlessness to persist for some considerable time, and during the acute stage there is always the risk of sudden heart failure from even such slight exertion as sitting up in bed. (*c*) In the gastro-intestinal form there are all the signs of an acute catarrh of the stomach and bowels, with vomiting, diarrhœa, and fever. This form, although very uncomfortable while it lasts, is usually of fairly short duration and quickly recovered from. (*d*) The nervous form of influenza is in some respects the worst of all, and may attack those who are perfectly fit, but is more likely to number among its victims those who are overworked, run down, or exhausted by previous attacks of influenza. With the fever and aching there is mental confusion, passing on sometimes to wild delirium or even mania. The symptoms are very like those of an acute meningitis, and sometimes influenza does actually set up an acute meningitis. The acute stage may only last a day or two, but afterwards there is apt to be neuralgia or neuritis, and also a rather prolonged period of mental depression.

The outlook in influenza is favourable for a rapid recovery if the patient will go to bed and be a complete invalid so long as the symptoms are at all acute. If this is not done, there is always a risk, and a very considerable one too, that he either becomes very acutely ill, or that the condition drags on, with a long period of subsequent physical and nervous exhaustion and general loss of grip. The number of cases of nervous breakdown which can be traced to neglected attacks of influenza—even quite mild ones—is very large. The outlook is only immediately serious in cases where the heart becomes much dilated, and in old people with the lungs affected by the influenza.

Treatment.—It is most important that care should be taken from the very outset, no matter how mild the attack. The patient should go to bed, and stay there until all feverishness and acute symptoms have completely disappeared. During the stay in bed there should be no seeing of friends or attempts to do business. To begin with, a dose of calomel (3 grains) or a couple of compound aloin tabloids should be taken to clear out the bowels. Ammoniated tincture of quinine in teaspoonful doses every four or five hours may then be taken for a day or so. If the aching and headache are very severe, 10 grains of phenalgin or phenacetin may be tried, and repeated two or three times a day if necessary. For the sore throat, gargling or swabbing with equal parts of boroglyceride and glycerine, or gargling with glyco-thymoline (a teaspoonful to a cupful of warm water), are the best measures. If bronchitis or pneumonia supervene, the treatment is as detailed under these headings. In the gastro-intestinal form there is little use attempting to feed the patient while vomiting is severe. Water should be given freely to drink, however, and as soon as the vomiting abates the patient may be given peptonised milk, going on then to ordinary milk and strong soups, given often but in small amounts, this being the ordinary diet during the acute stage of all forms. Where there is any sign of dilatation of the heart, as detected by the doctor on examination, or as evidenced by breathlessness, the very greatest care must be taken. Patients have sometimes to be forbidden even to sit up, and, when allowed to be up and about, must very gradually increase their amount of exercise, keeping always short of producing breathlessness. Convalescence should never be begun too soon. There is no immunity conferred by an attack of influenza—rather the reverse, for a person is more liable to take it after having once had it, and there is a considerable risk of relapses if one gets about before complete recovery. For the limp feeling—like that of a collar with all the starch out of it, as a patient of the writer's once described it—which practically always follows an attack the following tonic will be found very useful:

℞ Dilute phosphoric acid . . .	3 drachms
Compound tincture of cardamoms .	6 drachms
Liquor strychninæ	36 minims
Compound infusion of gentian .	to 6 ounces

Mix. Make into a mixture. Take a tablespoonful in a little water thrice daily a quarter of an hour before meals.

After very bad attacks, or a succession of them, the patient is often such a wreck that a regular rest-cure must be undergone (see under NEURASTHENIA), and, if possible, the patient should go for a little while to some warm, sunny climate. A special word of warning should be given against the use of wines or spirits to counteract the feeling of depression so common after influenza. They should be shunned like the devil at this time, because it is no uncommon thing for a regular craving for drink to be thus started, and the individual to become a confirmed alcoholic, and even to end up as a dipsomaniac. The tonic which we have recommended above should rather be trusted in for " bucking-up " and getting rid of the feeling of languor, care being taken, of course, that there is not too rapid resumption of heavy or responsible duties or going for too long periods without food. We have intentionally struck rather an alarmist note with regard to influenza and the care necessary for an attack. It is *par excellence* the disease in which it is safer to err on the side of too much care rather than on that of too little, and we can only hope that the warning will at least induce a few to take this care, and diminish the really enormous amount of unnecessary suffering and loss of energy which neglected influenza is responsible for.

Ingrowing Nails.—See under NAILS and TOES.

Insanity.—Insanity, lunacy, madness, mental disease, or unsoundness of mind, &c. &c., is a condition which no one has ever yet succeeded in satisfactorily defining, either from a legal or a medical point of view. Everyone has some idea of what is meant by these terms, which are used more or less interchangeably; possibly their views will be somewhat more clearly focussed after perusal of this article, but the first point we would like to insist upon is that insanity should be regarded as a disease, just in the same way as measles or rheumatism are diseases. Insanity implies disordered working of the brain due to disease affecting it, and should not therefore be regarded with scorn and looked upon as something shameful or reproachful, any more than are symptoms resulting from disease or disordered action of, say, the lungs or stomach. The human brain is an exceedingly complex and delicate organ, and the symptoms which arise from its disordered working are correspondingly varied; but the limits within which its actions are to be regarded as normal and sound, or sane, must be taken as very wide, extending, on the one hand, from the man of great genius to the crank and eccentric on the other. The borderline between the latter and the technically insane is often very slight and difficult to define. There is a tendency nowadays on the part of some writers to cast the net of insanity so wide as to make out that all men are mad on some point or other, but this is a view with which we have no sympathy. If seriously believed in, it would shake all the bonds of society, and lessen all idea of responsibility for actions, and be used as a plea and excuse for all sorts of folly and crime. There are undoubtedly actions performed at times by individuals or by masses of people which are more those of madness than of sanity, and yet it would be subversive of all law and order to regard these as the workings of a mind diseased, and therefore not responsible. Disease or defect in the working of the brain must be shown to exist before a person can be considered as insane, and irresponsible for his actions.

The legal test for insanity is that a man does not understand the nature of his action, or, if he does, that he does not distinguish between right and wrong, is insane, and therefore irresponsible. The medical view is not quite the same as this, because it recognises that in some cases a man may be able to distinguish between right and wrong, and yet be so irresistibly governed by insane impulses or ideas as to be quite incapable of controlling his actions. Conduct is, in fact, often made the test of sanity rather than belief, and in many cases it is undoubtedly the best practical test of a man's sanity or insanity. In the great majority of instances a person's conduct is the first thing to be altered by disordered brain action, but yet there are some cases where a man may be unsound in mind and his conduct still come up to the same standard, and there are, of course, frequently changes in conduct within the limits of sanity. Whilst in many instances there is no difficulty in settling the question of sanity or insanity, in others—cases on the borderland—it is often notoriously difficult to decide as to the sanity and responsibility of the individual for his actions, and to agree as to what is best and right to do for the sake of the individual and for the protection of society.

Causes of Insanity.—The popular idea is that mental unsoundness is usually caused by some mental strain or stress, but this is practically never the truth, or, at least, not the whole truth. It is very doubtful if a perfectly sound brain can ever be so unhinged in its workings through mental stress as to constitute insanity. It is only when there are flaws in the brain constitution, either by inheritance or from bodily disease, that purely mental worries are capable of causing insanity. The origin of insanity is seldom a simple one; several factors have generally been at work, some of them to be regarded as predisposing to insanity, others as exciting or immediate causes, the one set, however, unable to cause insanity without the other.

Of all the causes of insanity, hereditary influences—the nervous constitution with which a person is born—is undoubtedly the most important. Let it be understood that it is not actual brain disease which is inherited, as a rule, but merely an instability of the nervous system, which renders the individual less able to withstand the wear and tear of existence, and more liable—infinitely more liable—to become insane than those of a sound stock. Sometimes the child is born with such gross brain defect as to be practically insane from birth; this is considered separately under the heading IDIOCY. The importance of being born of a good sound stock will be evident, and the new science of eugenics is one which is attempting to bring about an improvement in the race in this respect by scientific selection in marriage. It may not seem an easy nor a desirable thing to manipulate or control human emotion in this way, but, for the sake of posterity and the future of the race, it certainly seems desirable that some sort of care should be taken in the choice of a life-partner, so as to raise rather than lower the level of the next generation. This means that not only should marriage with a person who has insanity in the family be avoided—a point which is already, to some extent, at all events, appreciated—but also that, as far as possible, one's mate should be of a sound bodily constitution and of good habits, for mental unsoundness may spring from a stock which has an inheritance of weakness on the physical as well as from one weak on the mental side. Should an individual have the bad fortune to come of a bad stock, the hereditary influences may to a certain extent be counteracted by being brought up along certain definite lines. The bodily nourishment should be as good as possible, especially during childhood. The mental development should be retarded rather than pushed. This is a tendency which is hard to avoid, for, as is well known, mental brilliance, or even genius, is very apt to appear in the same family as mental instability, and there is always a temptation with a bright, talented child to push the brain development at too early a stage. The risks, however, with a child of unstable stock are enormous, and it seems wasteful to produce a genius at the cost of a large number of degenerates. The education and occupation of the individual should rather be slow, outdoor, unexciting, and demanding steady routine qualities rather than stimulating and making severe demands upon the brain. If this plan can be followed, the later development of the individual will have a much better chance of being strong and healthy. The period of puberty and adolescence is one which requires very special watching, and controlling, as far as may be, of the social influences to which the individual is subjected. If this is passed safely without any signs of mental unsoundness, then the further outlook is much more hopeful. The marriage of blood relations or cousins is, of course, specially liable to accentuate evil qualities which may be present on both sides; but, on the other hand, if the stock is a good one, no harm, but rather the reverse, may follow.

Too much excitement, or sudden changes in environment, such as a change from a quiet country life to the whirl and bustle of town existence, is often sufficient to upset the balance in the case of a brain which is not very stable to commence with; and so may the contrary condition—namely, being suddenly called upon to lead an isolated life away from one's fellow-creatures.

Mental causes do play a certain part, although, as already mentioned, but a small one, in the production of insanity; when they do so, it will be found to be emotional strain or worry rather than intellectual strain or work which has been at fault. Domestic affliction is probably the most potent factor in this respect. Business worries are frequently blamed, but it is probably often the case that the worrying is the first symptom rather than the cause of the mental unsoundness. Religion is another factor often put down as a cause of insanity, but although, no doubt, morbid religious ideas are exceedingly common in insanity, they, again, are a result rather than a cause. Religion of the right sort, quiet and calm, preserves the mental balance of many a person; but when an individual who is perhaps somewhat mentally unstrung becomes subjected to the hysterical influence of a religious revival, the very worst consequences may follow.

There are a large number of agents which cause insanity by their direct action on the brain, acting as brain poisons. Some of these are introduced into the body from without, others are formed within the body, either through the action of germs or by perverted chemical action on the part of some of the bodily structures. Let us take the latter group first, the insanities due to poisons generated within the body. The most familiar of this class is the delirium or temporary insanity, for it is nothing else, which accompanies so many feverish conditions. This is not technically considered as insanity, however, and is dealt with under DELIRIUM. Fevers do sometimes lead to more long-lasting unsoundness of mind, and of them all influenza must be mentioned as the most important, for this fever leaves in its trail a condition of nervous exhaustion not so very infrequently amounting to actual melancholia. Brain exhaustion from overwork and other causes, insomnia, sunstroke, blows or falls on the head, epilepsy, brain tumours, and other forms of gross nervous disease, may, through poisons which are formed, or in other ways, lead to insanity. Less frequent causes are consumption; disease of the thyroid gland, either myxœdema or exophthalmic goitre; malaria; pellagra; and the disordered action of the generative organs which sometimes occurs in women after childbirth. There are many other diseases which occasionally lead to insanity, but only comparatively infrequently, so that they do not require to be mentioned individually.

Of poisons introduced into the body from without, alcohol is the most important as a producer of mental unsoundness. Considerable variety of opinion prevails as to the exact rôle played by alcohol in the production of insanity. There is a general consensus of opinion, however, that the children of drunkards inherit both a bodily and a mental weakness which, leaving all other factors out of account, predisposes them not only to insanity and feeble-mindedness, but also to epilepsy, consumption, and other diseases. While an individual of sound bodily and mental stock can take alcohol in moderation with impunity, it is far otherwise with one of a bad nervous inheritance. In such an individual alcohol is very often one, if not the only, factor which leads to insanity. In such persons, of course, it is admitted that there is usually a craving for excitements and stimulation of all sorts, and alcohol is the most easily obtained; so that, while the craving may be a symptom of mental instability, when indulgence becomes pronounced it is, without any doubt, an active factor in the actual production of insanity. When taken to excess, no brain, however strong, can escape some bad mental effects, even if not actual insanity. Looking to the widespread use of alcoholic beverages by the most energetic races in the world, and the craving for alcoholic stimulants by mankind through all ages and under all conditions, one can hardly in common honesty deny that it has, or may have, some good effects, but it equally cannot be denied that the risks attending its use are very great, and that, taken in the mass, it does much more harm than good. That it is not such an all-important cause of insanity as some temperance fanatics would try to make out is shown by the fact that one of the most notoriously sober bodies of men—viz. the Quakers—have a larger proportion of mentally unsound amongst their numbers than the population as a whole has.

Other poisons which have similar effects to alcohol when indulged in to excess are opium and its derivatives, such as morphia, Indian hemp (hashish), cocaine, &c.

Varieties of Insanity.—1. *Early and Warning Symptoms.*—It is only in a minority of cases that insanity comes on suddenly; far more commonly there is a period during which the condition is developing, and during which, if the state of affairs be properly realised, treatment is most likely to be effective. Unfortunately these symptoms may be slight and pass unrecognised. It is easy to be wise after the event, and to discern afterwards how one might have read the signs of the times, but it is by no means so easy beforehand. The following features might, however, especially in any one known to come of an unsound stock, make one suspect what is impending, and lead one to consult a doctor or mental specialist during the most hopeful period. Changes in disposition are perhaps the most readily observed, such as the development of periods of emotionalism; irritability; loss of power of concentration; morbid anxieties and fears; or general suspiciousness, which is a very common feature. Changes in the usual habits, without any very definite cause or reason for the change being apparent, is another common symptom. Bodily symptoms usually accompany these mental changes—indeed, they are often present first, although the significance of them is not realised at the time. These comprise headaches, neuralgia, indigestion, and loss of weight; curious feelings or sensations in the head or other parts of the body, sometimes accompanied by vague dreads; changes in the expression, either in the direction of dullness or excitability, not infrequently accompanied by a general fidgetiness or restlessness; sleeplessness, which is very common. These and other symptoms point to disordered bodily and mental health.

2. *Melancholia or Mental Depression.*—This is a form of insanity which generally comes on gradually. The patient suffers firstly from ordinary depression of spirits, or sadness, such as any sane person may suffer from when distressing events occur in their life; but, instead of the condition being gradually thrown off, as it is in a normally constituted being, the condition deepens, there is complete loss of enjoyment in life and of the sense of wellbeing, marked insomnia and loss of weight, no interest in work or outside affairs, but constant introspection and brooding on self. The condition may be said to have passed beyond simple melancholy into insane melancholia, when the patient's powers of reasoning and normal feeling have become so altered that delusions appear. Delusions constitute one of the most convincing proofs of insanity to the legal mind, and be it remembered that, although a medical man may have the certification of a lunatic, it is a magistrate who has the supervision of the certificate of lunacy and the power to admit to an asylum. A *delusion* may be defined as a belief which, to another person in a similar position in life, appears obviously false, but which no amount of evidence to the contrary will convince is false. Delusions cover all the range of human interests; they commonly take the form of imagining that they are great sinners, or have done some great wrong, or that they cannot or should not eat, or that they are being persecuted. These delusions are acted upon, so that food may be refused altogether, or, in order to get away from the overpowering sense of sinfulness, suicide may be attempted. Suicidal tendencies, indeed, are present in the great majority of cases of melancholia, and cases have constantly to be watched for fear of this. There is a special form of melancholia, sometimes called acute melancholia, in which the patient is restless, agitated, wringing the hands, and often suffering from *hallucinations* of the senses—*i.e.* having false perceptions for which there is no objective cause. These hallucinations are commonly of sight and hearing—seeing animals crawling or running about where there are none, or hearing voices when there are none. Melancholia may be recovered from; many cases are, especially when taken in hand early; but, on the other hand, cases may pass into incurable dementia.

3. *Mania or Mental Exaltation.*—Mania may come on very rapidly, but often there is a phase in which the individual is only restless and unsettled, and beginning to lose respect for the conventionalities of life. They then pass into a definite state of mania, in which they are markedly off their heads. This feature is much more striking

than in melancholia, in which, apart from their particular delusions, the patient's behaviour may be quite rational, although depressed, whereas in mania the whole bearing and speech is more likely to be irrational. The appearance is usually wild and excited; they are talkative, boastful, impatient of any control, and have no idea that anything is wrong—unlike the melancholic, who usually has. The patients may be violent, though not often dangerously so, but it is characteristic that there usually develops dislike for friends and relatives, and frequently delusions and suspicions about them. The condition may pass off after some weeks or months, but, on the contrary, it also may pass into mental dissolution or dementia.

3. A third group of cases, which, according to many authorities, is a large one, consists of those in which maniacal and melancholic states alternate in the same patient, or in which the one condition passes into the other.

4. A fourth group includes those in which, although there may be some of the features of either mania or melancholia, the main characteristic is a condition of *stupor or confusion.* Such a patient behaves like a log, takes no notice when spoken to, will remain for hours in any position he is put into, has no appreciation of his surroundings, and no active desires or affections. Sometimes such cases suddenly change without any warning, and become impulsive and dangerous to themselves or others. They become the subjects of *impulsive insanity,* a form which also occurs without any previous stuporose state. The forms which these impulses and loss of control may assume are very varied. They may lead to attempts at suicide or homicide, to senseless stealing (kleptomania), to fire-raising (pyromania), &c. Another form of limited insanity is that known as *delusional insanity, monomania,* or *paranoia.* The delusions are infinite in their variety, but commonly they fall under the heading of delusions of grandeur, or of delusions of suspicion or persecution. Thus a person otherwise sane and rational in his behaviour will gravely tell you that he is the real Shah of Persia; or that he is the Messiah, just recently arrived on earth; or that he is a multi-millionaire, when he really may not have twopence to bless himself with; or he has enemies who mesmerise him from a distance, or have fixed up electrical connections all round him which make his life a misery. Many persons with limited delusions are capable of attending to their affairs, but in others the delusions lead to such abnormal conduct that it is not safe for the individuals to be left in full liberty. These delusions may be gradually lost, but sometimes they become fixed and permanent, and quite incurable.

5. *Secondary dementia* is the condition which cases of mania or melancholia who do not recover end in. Such cases present a general weakening of mental power, diminution of feeling, loss of initiative, and impairment of conduct. Such persons are mentally dead. It is found that a much larger proportion of cases of mania become dements than cases of melancholia—in other words, that melancholia is a more curable condition than mania.

6. *Insanity connected with Child-bearing.*—This constitutes about 10 per cent. of the insanity in the female sex, but luckily it is amongst the most curable forms of mental unsoundness. About half of the cases occur within a fortnight of childbirth, and are due to an acute poisoning, aided possibly by the physical and mental strain which has been undergone. It takes the form of acute mania, combined with bodily weakness and feverishness. The patient must be constantly watched owing to the risk of suicide; the baby must be removed, as there is nearly always dislike of it, passive, if not actually active. Within a few weeks or months complete recovery usually occurs. Some milder cases of insanity may come on in later stages of nursing, especially in poor, underfed mothers; in a few melancholia may come on during pregnancy, but this also tends to pass off after the child is born.

7. *Epilepsy* is a disease which very commonly causes mental enfeeblement, which, in about half of all cases, amounts to actual insanity. In early life it takes the form of more or less imbecility; when it comes on in later life it is characterised mainly by irritability and impulsiveness, passing on sometimes to secondary dementia. (See Epilepsy.)

8. *Alcoholic Insanity.*—The importance of the rôle played by alcohol as a brain and mind poison has already been insisted upon in dealing with the causation of insanity, but it is probably not correct to speak of a special form of alcoholic insanity—except, perhaps, in the case of acute alcoholism or delirium tremens, which is a temporary insanity, although, seeing that the condition is usually quickly recovered from under treatment, it is not desirable for the patient to be certified and sent to an asylum, although he had to be watched with all the care that is necessary in the case of a person who is irresponsible for his actions. (See Delirium Tremens.) Chronic soaking in alcohol leads rather to a confused state of mind, often accompanied by hallucinations, especially of hearing, so that the patient is apt to do stupid or dangerous acts in obedience to imaginary voices. If this condition lasts long, the state becomes that described as "delusional insanity," the craving for drink still persisting. As in all forms of alcoholism, there is diminution or loss of moral sense in all its forms—of truth, duty, affection, &c. Another group of alcoholics become demented, using the word in its limited scientific application—*i.e.* more or less completely mindless. In this stage the craving for alcohol usually passes away. Uncontrollable craving for drink is often called by the term "dipsomania."

9. *General Paralysis.*—This form of insanity is one which occupies a place apart, inasmuch as it has very definite bodily symptoms as well as mental symptoms, and also on account of its causation. In most if not actually in all instances it is due to syphilis, and may therefore come on in any person who has had that disease. But as, after all, only a very small proportion of those who have acquired syphilis become general paralytics, some other factor is necessary for its development. At present, however, what this other factor or factors may be we do not know. This dread disease is one which statistics show to be decidedly on the increase in our cities and industrial centres, although it is practically un-

known in country districts. It usually comes on in mid-life, and men are more frequently attacked than women. A very few juvenile cases have been recorded, all in children who are subjects of congenital syphilis derived from their parents. With this exception, hereditary influences, so far as we know, play no part in the causation of the disease. It is, above all forms of insanity, one in which the individual is himself responsible for acquiring the infection which leads to the disease, with its inevitable ghastly ending. In its typical form this disease begins with tremulous and slurring speech, shaky handwriting, sleeplessness, restlessness, and excitement, with extravagant delusions of grandeur of all sorts. The individual, for instance, imagines that he is possessed of untold riches, and goes and indulges in wild orgies of speculation, or of ordering goods on a scale corresponding, or he believes that he is the finest singer or the strongest man in the world, or has other delusions of a like sort. The pupils of the eyes will often be found to be irregular in outline, and they either do not react at all to light in the way of contracting when exposed to a bright light and dilating in a feeble light, or, if they do so, the reaction is a very sluggish one, unlike the brisk reaction of the eye of a healthy person when similarly examined. Attacks of feverishness and convulsive seizures are liable to occur every now and again. Within usually a few months the disease progresses into the second stage, in which the patient is less excited and exalted, exhibiting rather mental confusion, dullness and apathy, with increasing bodily weakness. In the third and final stage the patient is almost completely paralysed, with loss of all the mental faculties, unable to speak or even to recognise his nearest friends, and lies, a helpless and inanimate log, till death brings a merciful release, either through weakness or through the advent of some slight infectious disease. An increasing number of cases do not nowadays follow this so-called classical type, but begin either with convulsive seizures and periods of unconsciousness, any one of which may terminate existence, or they commence more gradually, but without excitement and delusions of grandeur, rather becoming simply foolish, and lacking in mental control and energy, and slowly developing symptoms of paralysis, passing, without any very definite stages, into dementia and complete bodily paralysis. In some instances remissions occur in the course of the disease, in which the patient may appear to be cured, but this is only a seeming improvement; for in all cases, no matter what the type, the disease is steadily progressive in its downward course, and, in spite of all known treatment, leads to a fatal issue inside, at most, a few years.

These forms include all the main types of insanity, and most cases can be placed in one or other class of the category. There still remain, however, a considerable number of persons, often very difficult and troublesome to deal with, who can scarcely be called insane, but are better described as "degenerates," or, sometimes, as "borderland" cases. In these the conduct may depart from the normal in many different ways, but it is only when the disturbance of conduct is very marked that they can be reckoned amongst the insane. With regard to the *age* at which insanity is liable to show itself, the period of childhood, apart from congenital idiocy or imbecility, is not one in which insanity is likely to come on, although this period is one in which habits and training are all-important in counteracting any hereditary tendency that way. It is with the changes which set in with puberty, and the rapid mental development which goes on from then during the whole stage of adolescence—the stormy period of life—that danger looms ahead. During this period, say from the age of fourteen to that of twenty-five, in persons of a weak nervous or mental heredity, "adolescent insanity," usually taking the form of exaltation or mania, is particularly liable to occur. The years from twenty-five to forty-five should be among the sanest of life, but, under the strain of modern existence, especially in cities, experience hardly bears this out. Amongst the industrial classes, at all events, and more especially in the lower grades of them, this is probably the most common period for mental breakdowns to occur. The insanity of this age-period is generally not the exaltation of adolescence, but rather depression, delusional insanity, alcoholic insanity, or insanity connected with child-bearing. In older periods of life melancholia is the commonest form of insanity, or else simple dementia, an exaggeration of the dotage of old age.

Treatment of Insanity.—Much may be done to counteract the evil effects of bad heredity and to avoid the causes which lead to insanity, provided that there is knowledge on the part of parents and guardians and of the individual what to do, and what not to do. It is with the object of giving some guidance in this direction that the causation of insanity has been so comparatively fully gone into. But naturally it is impossible, within the limits of such a work as this, to discuss such a problem fully, and it will generally be found advisable to get the advice of a doctor, especially of one skilled in dealing with mental cases, when such problems as the upbringing and training or the choice of a profession have to be faced in the case of an individual with some family tendencies towards mental unsoundness. Two good books on the subject, written for the general reader, and to which the writer must express his indebtedness in the preparation of this article, are those by Sir Thomas Clouston on *Unsoundness of Mind* and *Mental Hygiene*. A few of the main points may just be recapitulated here. Children of a nervous stock should, if possible, be brought up in the country. They should, in any case, have abundance of fresh air, and their diet should be liberal but of a non-stimulating kind, milk, eggs, vegetables, and cereals forming the bulk of it. Too much either of bodily or mental excitement is to be avoided. Schooling is often a very difficult problem. In many cases education at home, if it can be carried out, is the best; but, as this is not very often possible, the great thing is to see that they are not pushed too much at school. Far better a little backwardness in mere book-learning of facts than the excitement and strain apparently inseparable from the pernicious modern system of cramming and examinations. The social atmosphere in which the child is brought up cannot, of course, always be chosen or modified very much, but, as far as possible, it should be a cheerful one, but amongst calm, restful persons and surroundings rather than amongst excitable persons of the same nervous temperament, to whom, unfortunately, there will probably be an innate attraction. Rational amusements and pleasures are not, of course, to be cut off, but they should be in moderation, and not made the be-all and end-all of existence. With regard to the choice of occupation, there is always a tendency for those of a nervous constitution to incline towards work involving considerable brain-work and with excitement, but such a course is often ill-advised. An outdoor occupation, or one in which there is not too much responsibility, is more frequently one which would be better suited and less likely to lead to mental breakdown later on in life. With regard to marriage, one need only say that there is no disease, and no tendency to disease, which should be more carefully inquired into before marriage is contemplated by anyone, whether of a nervous stock or not, but, of course, more particularly on the part of anyone who has actually had a mental breakdown or who has insanity in any near relative. We cannot say more than that the future should be seriously considered in such cases, both with regard to the individuals themselves concerned, and also for the sake of possible descendants.

During the early warning stage which precedes many cases of insanity, in which the symptoms are more bodily than mental, a good deal can often be done to ward off an actual attack if the condition be recognised and taken in time. Any bodily symptoms or disease will require to be treated in the first instance. A change of scene and surroundings will often work wonders, some cases being the better of rest for a little while, but more often an open-air country life will be found suitable. Rapid or exciting travelling and sea-voyages should not be undertaken. The removal of all causes of worry and anxiety, so far as that is possible, is clearly indicated. Good, plain, but appetising feeding, with the use of tonics and preparations like cod-liver oil and extract of malt, are often useful, and every effort should be made to put on weight. Sleeplessness must be combated, if necessary, by the judicious use of sleeping-draughts or nerve sedatives, but these should not be employed without the direct advice of a medical man.

Not very much need be said about the treatment of actual present insanity, because in such cases the advice of a medical man will always have to be obtained. The important problem will have to be decided whether the patient is to be treated at home, or whether he or she is to be treated away from home or in an asylum. In the majority of cases, probably, the home is the worst place of all for treatment, but there are some important exceptions. Cases of delirium due to brain-poisons and of short duration, of insanity connected with child-bearing, of very slight melancholia, of harmless delusions, and some cases of epileptic excitement and of senile dementia, do very well at home, if good nursing and attendance can be secured. Cases almost inevitably demanding institutional treatment are those where limited means will not admit of home treatment, or those in which acute symptoms persist, where there are persistent suicidal tendencies, great violence or homicidal impulses, or where the habits become so offensive or objectionable as to demand the firmer control and closer watching which is only possible in an asylum or mental hospital. If an asylum is decided upon, certain legal forms and medical certificates are required, but the arranging about these can be left to the doctor. We need not go into any details regarding the treatment suited for the different kinds of insanity as applied in an asylum, beyond saying that all cruel restraint and violent measures are now a thing of the past, and the life of a patient in many institutions is now rather an enviable one than otherwise, although, unfortunately, they are not always in a state capable of appreciating the care they receive, or the fine easy time which they have. Great attention is now always paid to the bodily condition of the patients, as it is realised that the condition of the brain depends to a considerable degree on the condition of the body as a whole, or, in other words, that mind can be influenced by matter just as much as it can have an influence over matter. Melancholics require special watching on account of their suicidal tendencies, and another great point is to get them fattened. When a melancholic begins to put on weight and to have headaches, to have bodily instead of mental symptoms, it is a very good sign. The sleeplessness of melancholia, and also of other forms of insanity, is often a difficult feature to deal with, but nevertheless a very important one. Various hypnotic and sedative drugs may have to be employed, but the temptation to use them too readily and freely for the sake of peace is one which has to be avoided, both by doctors and nurses in charge of mental cases. These drugs should not be employed until other measures have been tried, such as plenty of fresh air during the day, so as to produce a healthy tiredness, open windows at night, change of air, hot drinks and warm baths at bed-time, massage at night, reading some interesting yet not too exciting book in the evening, &c. The patient should also be taken out of himself by some means or other, and interested in work or play, and kept from being entirely self-centred. The choice of a congenial and suitable nurse or companion is a very important matter, as a managing and tactful, conscientious attendant is often half the battle. Luckily, well-trained mental nurses, both male and female, are now available in most large centres. Cases of mania are generally more troublesome to deal with, because, not realising that anything is wrong, they are more resentful of control. Actual physical restraint is only very rarely necessary; the old-fashioned, barbarous strait-jacket is now only to be seen in museums, tactful management and persuasion being generally successful in controlling them. In the acute stages of mental exaltation the patient is usually kept in bed, because the condition leads to a great output of nerve energy and exhaustion of the brain cells. Baths and sedative drugs are also often employed to soothe during the acute stages of mania.

Insomnia.—See SLEEPLESSNESS.

Intermittent Fever.—See MALARIA.

Intestines, Diseases of the.—The bowels as a whole, or different parts of them, are liable to be the seat of a number of conditions, some mild, some serious, but often much alike in their symptoms, and difficult to distinguish from one another. A number of them are dealt with separately under individual headings, such as APPENDICITIS;

Cholera; Colic; Constipation; Diarrhœa; Dysentery; Hernia; Parasites; Peritonitis; Piles; Rectum and Anus, Diseases of the; Typhoid Fever; in all of which the disease and some of the main symptoms, at all events, are connected with the bowels.

Inflammation of the Bowels, or Enteritis.—Several varieties of this must be distinguished. When the outer coat or covering of the bowels is the seat of the inflammation, the condition is described as *peritonitis*, and is dealt with separately under that heading. When the interior of the bowel is affected, it may be by a *catarrhal enteritis.* This may be part of some more general disease, such as influenza, blood-poisoning, &c.; it can be caused by nervousness and anxiety, simple exposure to cold, or chill, but is most commonly due to the presence of some irritant substance, such as decomposing food, unripe fruit, and so forth. When the stomach is similarly affected, the symptoms will generally commence with sickness and vomiting; the symptoms due to the involvement of the bowels are chiefly colicky pains and diarrhœa. The stools may often be observed to be very foul-smelling or to contain undigested food and much mucus, giving them a slimy character, or, in severe cases, may contain blood. Serious cases may lead to peritonitis or paralysis of the bowel, and symptoms of intestinal obstruction. (See below.) The degree of feverishness and the rate of the pulse are usually fairly good guides to the severity of the case. If the temperature be much raised (say over 101° F.), or if the pulse be rapid (over 90 or 100), and small and wiry, then there should be no delay in obtaining medical advice. Catarrh of the duodenum, the first part of the bowel, usually secondary to a catarrh of the stomach, has a distinctive feature in that jaundice is produced by blocking of the orifice of the bile-duct. (See Jaundice.)

The treatment of milder cases, where there is no complication beyond the catarrh, is very much that of diarrhœa and colic. The patient should be put to bed and starved at first. By giving no food the bowel gets a better chance to rest and recover. Very small sips of water to drink or ice to suck may be allowed. It is often advisable to clear out any irritant which may still be there by giving a dose of castor oil containing from 10 to 20 drops of laudanum. An ice-bag, or else hot fomentations or poultices, should be applied to the abdomen. If the condition lasts any time and food has to be given, or when food is commenced after a day or so of starvation, the articles most suitable are small quantities of milk and potass, beef-juice or beef-tea, and chicken jelly, and they are better given cold or even iced. Should the diarrhœa continue, chalk mixture in tablespoonful doses thrice daily may safely be tried after the day of starvation is past. Should the symptoms persist for more than a few days, or if they are at all severe, as indicated by the amount of diarrhœa or pain, or by the degree of feverishness of the patient, do not delay in sending for the doctor, as serious abdominal conditions are easily overlooked at first during the stage when the treatment of them is most hopeful.

Inflammation of the bowel may take the form of *ulceration.* Typhoid fever and dysentery practically always cause some ulceration. Tuberculosis or consumption of the bowel, which is frequently the primary seat of consumption in children, but in adults is more likely to be secondary to consumption of the lungs from swallowing the sputum, also frequently causes ulceration. Severe constipation from the pressure and irritation caused by the hard masses of fæces is another cause of ulceration. The symptoms are not very definite. Except in acute conditions like typhoid and dysentery, the process is usually chronic, with occasional, but not constant, pain and diarrhœa, the stools containing pus, slimy mucus, and blood. One of the great risks from all forms of ulceration is perforation of the bowel and the development of peritonitis. Medical advice as to treatment should always be obtained.

A special and very characteristic form of inflammation is that known as *mucous colitis.* The striking feature of this is the passage of large quantities of mucus, often in the form of long, slimy casts of the interior of the bowel. The condition is invariably a chronic one, and is practically always associated with a condition of general neurasthenia or nervous exhaustion, sometimes amounting to actual hypochondriasis. The treatment requires to take into account both the general condition of the patient and the local disease. The best way of attacking the latter is still unsettled, several different plans being recommended, any one or none of which may be found satisfactory in any particular case. All of them, however, are prolonged and tedious, and beyond the scope of home treatment.

Obstruction of the Bowels.—An attack of obstruction is usually sudden in its onset, although there may have been a history of some chronic complaint, such as constipation or hernia, leading up to it. The symptoms are very severe, and if the condition is not relieved fairly soon it is generally fatal. It sets in with severe abdominal pain, felt most about the navel. At first the pain is spasmodic and colicky; later on it becomes continuous, but with periods of intenser agony. Vomiting soon commences, first of stomach contents, then of bile, and later of the contents of the intestine. There is usually absolute constipation, not even wind being passed; but sometimes the bowels move about the onset of the attack, the bowel emptying itself below the site of the obstruction. Another feature which soon develops is distension of the abdomen with gas, and with this distension the abdomen becomes increasingly tender to pressure, until the patient cannot bear the slightest touch or the weight of the bed-clothes. The appearance of the patient is anxious, with a pinched expression and clammy sweat on the brow, and his thirst is intense, but any fluid drunk is usually vomited at once. The legs are usually drawn up, so as to lessen the tautness of the abdominal muscles. The temperature is not necessarily raised at all, but the pulse is very rapid, small, and feeble. The symptoms are very similar to those of acute peritonitis, and also to those of a severe attack of appendicitis; but no great harm is done by confusing these conditions, provided that the gravity of the case and the need for urgent treatment, usually of the nature of operation, is realised.

The causes of obstruction are various; one of the commonest is the constriction of the bowel passing through a narrow aperture, such as the opening of a hernial sac, or by bands of adhesions which may form from some localised peritonitis or other cause. This is what is known as *strangulation.* Another cause is that technically called *volvulus,* which means that a loop of bowel becomes twisted or kinked upon itself. In children, perhaps the commonest cause is *intussusception.* This means the passage of one piece of bowel into the bowel below it, just as if the finger of a glove were being turned outside in. This most commonly occurs at the junction of the small with the large bowel, the former slipping down inside the latter. In this condition, which may follow on severe purging or diarrhœa or an attack of colic, there is, in addition to the other features of obstruction, the passage by the anus of bloodstained mucus, like red-currant jelly in appearance, and sometimes a sausage-like swelling can be seen across the upper part of the abdomen, due to the large bowel distended by the small one inside it. In the very earliest stages the condition can sometimes be relieved by the injection into the rectum of considerable quantities of warm water, or the inflation of the lower part of the bowel with air by a bicycle pump. This may drive back the bowel which is being invaginated inside; but it is only safe to try such procedures very early in the attack, because, if tried later, the risk of rupturing the distended bowel is very great. Other causes of obstruction, although not very common, are the impaction within the bowel of large *foreign bodies* which may have been swallowed, but it is amazing what large and even dangerous-looking sharp objects may be swallowed with impunity and evacuated safely. This is not meant as an encouragement to swallow objects just for the sake of seeing whether they will stick or not, but to allay needless anxiety in the case of children who swallow coins, fruit-stones, &c. In the great majority of instances the object passes along the whole length of the bowel without any difficulty, although sometimes, of course, it does stick, and may lead to obstruction. Intestinal concretions, or severe constipation and the impaction of hard masses of fæces, may also lead to total obstruction. Still another group of cases are due to *stricture of the wall of the gut,* which may arise through the healing of ulcers of the intestine, or to the development of cancer or other forms of tumour in the wall of the bowel. Lastly, all the features of obstruction may be present, without any gross obstruction, when any part of the wall of the intestine is the seat of an *acute inflammation,* such as in appendicitis. Such a condition causes a paralysis of the wall, so that virtually there is obstruction, as no contraction can occur in the paralysed part, and the contractions in the bowel above are turned back on themselves, so that they travel up the bowel, carrying the contents thereof with them; hence the vomiting of fæcal matter.

Treatment.—In the majority of cases surgical operation is required to relieve the strangulated bowel, to undo the kink, or to remove the obstructing foreign body or the inflamed and perhaps gangrenous appendix or portion of bowel, and, if done sufficiently early, before general peritonitis or other complications have set in, the results may be very satisfactory. Before the patient has been seen by the doctor the pain may be relieved by the application of hot fomentations or poultices to the abdomen. Opium or other pain-killing drugs should not be given until a definite diagnosis has been made, and the necessity or otherwise of operation decided upon, because they mask symptoms so much, and do not allow the gravity of the condition to be appreciated. Afterwards, if necessary, they may be employed. The thirst and sickness may be partially relieved, at all events, by giving the patient small pieces of ice to suck, or, if this cannot be obtained, frequent small sips of cold water. Where a nurse or doctor is in attendance, the stomach is not infrequently washed out for the relief of the awful nausea.

Intusussception.—See under INTESTINES, DISEASES OF THE.

Iritis, and Affections of the Iris.—See under EYE, DISEASES OF THE.

Ischio-rectal Abscess.—See under RECTUM AND ANUS, DISEASES OF THE.

Itch, or Scabies.—"The itch" is the popular name for a skin disease caused by the presence of a small mite, the *Acarus scabiei,* which burrows into the skin, and, by its presence, gives rise to great itchiness. It is naturally the less cleanly members of the population who suffer most from this disease, but it is a very common one, and may be met with in all ranks of society. The part of the body most often affected first is the backs of the hands and spaces between the fingers. On close examination the little corkscrew-like burrows made by the mite can be detected. The itchiness, which is usually worst at night, leads to constant scratching, and the itch-mites may be spread to other parts of the body by the finger-nails. In addition, the scratching often gives rise to an inflamed or eczematous condition of the skin, which, if it has lasted any time, rather masks the original condition, and makes it more difficult to recognise. Fortunately a cure can be rapidly obtained by the use of sulphur, provided that it is not employed in too perfunctory a manner. Get a cake of sulphur soap and a good supply of sulphur ointment—by the pound, if much of the body is affected. For three nights and mornings running take a warm bath, using the sulphur soap so as to get a plentiful lather, and rub it well in. Then, after drying, anoint freely with the sulphur ointment. The patient may have to go about his duties, but in cases which are at all extensive it is really better to stay in bed for the three days, wearing cotton gloves and some old night-apparel, so as to keep the skin in constant contact with the sulphur. Do not use sulphur for a longer period than three days. It not infrequently, even in that time, sets up an eczematous condition itself, but, if its use be persisted in under the belief that it is the original disease still present, it only gets worse and worse. On the other hand, if left alone or simply anointed with some soothing material, such as boracic ointment, it quickly disappears, and the original cause of the mischief, the itch-mites, will in most cases be found also to have been quite killed out. The underclothing worn before the cure should either be destroyed or subjected to a thorough baking, so as to kill off any parasites which may have lodged therein.

Itching, or Itchiness of the Skin.—This is a frequent concomitant of many skin diseases, and usually yields to the treatment suitable for the disease as a whole. The itchiness may be so intolerable, however, as to demand special relief, and this may usually be obtained by bathing it with some 1 in 60 carbolic lotion or dabbing the skin over with some tar lotion, such as:

℞ Liquor carbonis detergens . . .	2 drachms
Oxide of zinc	½ ounce
Water	to 6 ounces

The use of coal-tar soap instead of ordinary soap may be recommended, and only warm water should be used for washing. With sensitive skins rough towels and underclothing must be avoided. Baths containing bran or some baking soda dissolved in the water also relieve itching. The condition may be due to some general disease, of which diabetes and jaundice are perhaps the commonest examples. The same remedies may be employed to relieve the itchiness in these. In diabetes it is always advisable to sponge parts liable to be wetted by urine with plain water, so as to prevent any incrustation with the sugar, which causes great irritation and itchiness. In old people the skin is apt to lose its natural fat and to become preternaturally dry, a condition which often leads to distressing itchiness: this is best relieved by the application of greasy substances, such as simple lard, vaseline, or equal parts of lanoline and olive oil. A very severe and distressing form of itchiness occurs about the opening of the lower end of the bowel, and also sometimes in women about the opening of the front passage; this is often called *pruritus*. The cause of these forms is usually some local discharge or disease within the openings, and, although temporary relief may be obtained by the using of some of the lotions referred to above, a cure will not be obtained until this disease is recognised and treated. (See Rectum and Anus, Diseases of the, and Pruritus.)

Jail Fever.—An old term sometimes applied to Typhus Fever, which see.

Jaundice.—The term applied to the yellowish discoloration of the skin caused by bile. The commonest form of jaundice is that known as *catarrhal jaundice*, because it is due to a catarrh of the bile-duct, which prevents the flow of bile from the liver and gall-bladder into the intestine. This catarrh is usually secondary to a catarrh of the stomach and of the duodenum, or first part of the intestine, in which is situated the opening of the bile-duct. Jaundice may therefore follow on any indiscretion in diet, being usually preceded by the symptoms of gastric catarrh. (See under Stomach, Diseases of the.) It may also occur in almost any general fever, and may result from the irritation caused by the passage down the bile-duct of a gall-stone. (See Gall-stones.) When the escape of bile is thus prevented, it passes into the circulation, giving rise to various symptoms. The yellow discoloration is usually first evident in the white of the eye; then the skin and the lining of the mouth may be noticed to be turning yellow. Some of the bile gets excreted by the kidneys, and the urine will be observed to be of a yellowish-brown or greenish-brown colour. The absence of bile from the intestines causes marked constipation, and the stools are very light in colour, looking like clay or putty. Along with the discoloration of the skin there is usually a considerable degree of itchiness. The rate of the heart-beat is slowed, the pulse falling to perhaps 50, or even 40, per minute. With this slow circulation the patient feels languid, sleepy, and unfit for any mental exertion. There may be a little swelling of the abdomen, and tenderness to the touch over the region of the liver and gall-bladder—*i.e.* just under the ribs on the right side—from distension with bile. The symptoms in this form of jaundice should not last more than a few days or weeks at most.

Treatment.—At the onset, while there is still gastric catarrh present, the patient should remain in bed; this is not usually necessary for more than a day or two, unless the jaundice is very severe. If there is much vomiting and irritability of the stomach, nothing but hot water should be taken for the first twenty-four hours or so, and draughts of hot water will be found a good thing to take so long as there is any jaundice present. The diet should then be a liquid one for a few days, such articles as milk and soda, thin custards, arrowroot, and beef-tea. A popular and very satisfactory dish used amongst the poorer classes in Scotland is pease-meal brose or porridge. More solid articles may then be given, but throughout the whole time that jaundice is present only light, easily digestible food should be taken. Medicinally, while the stomach is irritable, probably the best thing is a tablespoonful every four hours, before meals, of the following sedative mixture:

℞ Bismuth subnitrate	240 grains
Dilute hydrocyanic acid . . .	48 minims
Tragacanth mucilage . . .	a sufficient quantity
Water	to 6 ounces

Make into a mixture.

Hot fomentations or poultices may also be applied over the region of the gall-bladder. The bowels should be kept acting regularly by the administration of Carlsbad salts or phosphate of soda. A good teaspoonful of the latter may be taken, dissolved in some hot water, night and morning. When the patient is well on the mend, improvement may be hastened by the following:

℞ Dilute nitro-hydrochloric acid .	1 drachm
Compound infusion of gentian .	to 6 ounces

Mix. Take a tablespoonful thrice daily before meals.

Other and more severe forms of obstructive jaundice are due to more complete blocking of the bile-ducts, which may result from such causes as impaction of gall-stones, cancer, or adhesions forming around the region of the gall-bladder. With jaundice coming on in an elderly person, if it does not disappear under such treatment as is given above, cancer or gall-stones must always be considered as the two most likely causes. With lasting jaundice the patient's colour may become dark green or almost black. The itchiness of the skin is apt to be very bad, and boils are also prone to occur. The temperament of the patient is at first irritable, later on great mental depression sets in. The outlook in such cases is only good where it is possible to remove the obstruction completely by operation, as, for instance, with gall-stones.

There is another form of jaundice, due to the presence of certain poisons which lead to rapid destruction of blood, throwing a great excess of blood-pigment into the liver. This form of jaundice is seen, for example, from snake poisons, in certain fevers (especially yellow fever), but sometimes also from severe attacks of scarlet fever, typhus, &c. The jaundice is, however, a comparatively unimportant symptom compared with the general signs of poisoning—fever, delirium, convulsions, suppression of urine, &c.—and calls for no special treatment. The disease known as acute yellow atrophy of the liver, which most commonly occurs in women after delivery (but is a very rare complaint), gives rise to a jaundice of this type.

In new-born children there is commonly a mild degree of jaundice about the third day, which requires no special treatment. Severe forms sometimes occur, associated either with congenital defects, which render continued existence impossible, or due occasionally to septic poisoning from the end of the navel string, which has somehow or other got infected.

Jiggers.—See under Parasites.

Joints, Affections of.—A *sprain* or strain involves the stretching or tearing of some of the ligamentous fibres around a joint as the result of sudden violence. If the tearing be extensive, it may permit of the displacement of one of the bones entering into the formation of the joint—in other words, a *dislocation*. (See section of the book dealing with First Aid.) A condition which commonly follows slighter degrees of sprain is *synovitis*. This means an inflammation of the membrane lining the joint cavity, and it sometimes comes on in persons with rheumatic tendencies, without any injury, although some blow or strain generally precedes the inflammation. The most obvious result is swelling, from increase in amount of the synovial fluid thrown out by the inflamed membrane. The joint will probably also feel hot to the touch, and looks red and is more or less painful. It is generally kept slightly bent, and movement of any sort is painful. In favourable cases the inflammation may subside and the fluid disappear in a few days. In others the condition tends to become chronic, in which case the pain disappears, being replaced by a sense of weakness and uselessness in the limb, and the muscles acting on the joint may undergo a marked degree of wasting and atrophy. The joint remains distended with fluid, and the condition is that commonly referred to as *water on the joint*. A still more unfortunate complication is when the inflamed synovial membrane becomes invaded by germs, either through a wound in the skin or from the interior of the body. All the structures of the joint are then liable to become the seat of an *acute arthritis*, and, when suppuration occurs, the whole joint may become one big abscess and have to be treated accordingly. A special form of acute arthritis, which usually comes on without any previous injury, and in which there is no suppuration, is *acute rheumatic arthritis*. Several joints may be, and commonly are, affected by acute joint rheumatism, which may or may not be part of a still more general attack of rheumatic fever. (See under Rheumatism.)

Treatment of Synovitis.—In the early or acute stage the joint affected should be kept at complete rest by appropriate means, such as splints or bandages, in the attitude which gives most relief from pain. If at all severe, the patient should be kept in bed. Cold cloths or an ice-bag applied over the joint may diminish the amount of effusion, and also relieve pain. Rest and immobilisation must not be maintained for too long, or there is a risk of a stiff joint forming. Whenever the acute stage is past—that is, when the heat, pain, and redness have gone—massage by a skilled masseur should be employed once or twice daily to get rid of the fluid and prevent the formation of adhesions. If adhesions have actually been allowed to form, they must be broken down by main force, the patient being under the influence of an anæsthetic or not, as he pleases. This is where the bone-setter excels. Knowing or caring nothing of possible risks, he will break down adhesions and free stiff joints in a manner that is often surprising; but he not infrequently overdoes it, or treats the wrong sort of case in this way (such as tubercular joints), and surgeons see a good deal of the after results of too energetic "bone-setting," just as bone-setters see the results, sometimes, of medical treatment of joints which has not been energetic enough. Blisters and other forms of counter-irritation, and even drawing off of some of the fluid with a syringe, are measures employed in the more chronic stages; but a person should never allow any swollen joint to run on for any length of time without seeking advice.

Tubercular Disease of Joints.—White swelling or cold abscess of joints occurs in both children and adults, but chiefly in those with inherited tubercular or consumptive tendencies. The sufferer is often also in poor general health, or living in poor or unhygienic surroundings, before the condition comes on. Some slight strain or injury, of which little notice is taken, is frequently the immediate origin of the settling down of tubercle bacilli in that particular joint. The disease then develops in a slow and insidious manner. Slight impairment of movement, together with some pain, especially when the limb is jarred, is probably the first sign of its development. If the joint is in one of the lower limbs, the patient will be limping. On examination of the joint it is seen to be swollen, and unusually rounded and smooth in its outlines. In colour it is white, but, in spite of its name, "cold abscess," it will be found, as a rule, to feel rather hotter than the corresponding joint on the other side of the body. The swollen tissues feel puffy and boggy, but there is not often fluctuation—that wave-like feeling to be made out when an abscess or cavity containing fluid is pressed and tapped between the two hands. The joint usually becomes more and more fixed and useless, generally in a slightly bent attitude. From time to time there are attacks of worse pain and swelling in the joint, lasting a few days, each one leaving it more crippled. Sooner or later the disease is likely to burst through the skin, giving temporary relief when the discharge of matter occurs; but, instead of healing following this, as it would in the case of an acute abscess, the discharge continues, fresh openings are likely to occur, and, even in spite of great care being taken, secondary infection of the abscess with ordinary pus-producing germs is apt to occur. The patient develops a hectic, swinging temperature, and, unless very prompt measures are taken, may be in a very serious condition. If taken in fairly good time, the outlook may be said to depend partly on the patient's general condition, partly on his surroundings. At the extremes of life the prospects are naturally not good. If every hygienic and medical form of treatment is available, a good recovery is to be expected, unless the hereditary weakness is very great; but in slums, where the hygienic conditions cannot be made so satisfactory, the outlook is not so favourable.

Treatment.—The general treatment of the patient is the same as that for all forms of tubercular disease, no matter what their situation in the body, and may almost be summed up in the words "fresh air and fattening feeding." (See under CONSUMPTION and TUBERCULOSIS.) For the local treatment the details must be left to the doctor in attendance, and will depend partly on the particular joint affected, and partly on the stage in which the disease is. The first principle of treatment is generally complete and absolute rest to the joint, and this is obtained by the use of plaster of Paris bandages or other forms of splints. Rest is Nature's cure for inflammation, and, as tubercle of joints is apt to be a slow and long-lasting inflammation, so must the rest be long-lasting, even though it be found by the patient to be "very slow." The splinting will require to come off from time to time for the joint to be examined, but fixation must still be the rule so long as there is any swelling, heat, or tender spot about the joint. Even then the splints are only to be done without gradually, and movement is slowly reacquired. The limb will be very useless at first, and massage will be very useful to restore tone to the wasted muscles. Adhesions may have formed in the joint; they are the result, not of the rest, but of the inflammation. If the joint has been badly disorganised, complete fixation and stiffness of the joint in a good position is the best result which can be obtained; if the adhesions are slight they may, if desired, be easily got rid of, but any rough handling of such a joint is to be avoided, lest tubercle should be lit up again. Other methods of treatment available in particular instances are venous engorgement of the joint by constriction of the limb above the joint with a rubber bandage for so many hours a day, the use of tuberculin injections, injections of iodoform or other antiseptics into the joint, draining of abscesses, excision of joints which are hopelessly disorganised, &c. &c.

Loose Bodies in Joints.—Bodies may form in joints as a result of some injury to the joint, hæmorrhage into it, and organisation of the blood-clot. They may also follow on inflammation, either acute or chronic, in the joint, or they may be pieces of cartilage or of synovial membrane which have become broken off. Symptoms are produced by this loose foreign body being occasionally caught between the articular surfaces of the bones entering into the formation of the joint, causing sickening pain and a temporary locking of the joint. The fixation is usually quite temporary, as the loose body soon slips out again, but the slight stretching of the ligaments is apt to make even such a temporary locking be followed by an attack of synovitis. Repeated attacks are almost certain to occur until the body is removed by operation. The knee-joint is that most often affected, and the symptoms are not very unlike those due to a loose semilunar cartilage in that joint. Displacement or twisting of one of the semilunar cartilages of the knee-joint also gives rise to painful locking of the joint, often, however, of a more permanent kind, and requiring manual aid to reduce the dislocation of the cartilage. There will also be, what there is not in the case of a loose body, a definite tender spot on one or other side of the knee, corresponding to the position of the injured cartilage. A displaced cartilage is also always due to some sprain, whereas a loose body may develop without any previous injury. Displaced cartilages may be kept in position by the use of suitable pads, but, if attacks of locking and subsequent synovitis and disablement are frequent, operative removal of the damaged cartilage is often necessary. The joint seems to be able to get on perfectly well without it.

For GOUT, RHEUMATISM, and RHEUMATOID ARTHRITIS, as they affect joints, see under these separate headings.

Hysterical affections of joints sometimes closely mimic the appearances of gross organic disease, and can often only be made out with certainty to be simply hysterical from the presence of other hysterical symptoms. It must be kept in mind, however, that real joint disease may occur in a hysterical subject, so that complaints with regard to some joint must not be lightly passed over without thorough examination.

Kakke.—See BERI-BERI.

Kala-azar.—An Indian name meaning "black disease." It is also known as "Dum-dum fever." This is a tropical disease widely spread in India, China, and in some parts of North-eastern Africa. It has only recently been definitely separated from malarial fever, and it is characterised by great enlargement of the spleen—and commonly, also, of the liver—anæmia, and irregularly intermittent fever. It is chronic in its course, but causes a high mortality amongst those acquiring the disease. It is now known to be due to a parasite which is introduced into the body through the bite of the bed-bug. This explains why Europeans seldom get the disease so long as they are cleanly in their habits and keep clear of native huts, also why the disease can be stamped out in a locality by segregation of the inhabitants and burning down of their houses. There is no satisfactory medicinal treatment known for the disease once it is established. Quinine does not have the same specific effect as in malaria, although it does reduce the fever to some extent, and is commonly given. Iron may also be employed for the anæmia.

Keloid.—See under SKIN DISEASES.

Keratitis.—Inflammation of the cornea, or clear part covering the front of the eye. (See under EYE, DISEASES OF THE.)

Kidneys, Affections of the.—What is perhaps the commonest, and certainly one of the most important, affections of the kidneys—viz. Bright's disease, in one or other of its different forms—is dealt with separately, and so are abnormal appearances of the urine (under BLADDER, DISEASES OF THE), only some of which are due to disease in the kidneys, however, others arising from affections of the bladder or other parts of the urinary tract.

Movable or Floating Kidney.—This is a condition which is much commoner in women than in men, and the right kidney is rather more frequently affected than the left. Probably many people have slight degrees of movable kidney, and only about half of those in whom one or other kidney is distinctly movable suffer from the condition in any way. When present, the symptoms vary with the degree of the displacement, and also with the nervousness or otherwise of the person's temperament. The more nervous or neurotic the temperament, the more likely are symptoms from the movable kidney to be pronounced. So much so is this the case that movable kidney is regarded by some as an actual cause of nervousness and even of insanity, but we would certainly not go the length of subscribing to this view so far as the latter complaint is concerned. The symptoms consist of a feeling of weight or drag in the side, colicky abdominal pains, and frequently well-marked indigestion. With a very freely floating kidney the patient may have, from time to time, attacks very like those of renal colic—*i.e.* of intense colicky pain on one side, shooting down into the groin and inner side of the thigh. (See below.) These are due to the kidney becoming twisted on itself at its stalk, where the blood-vessels enter it and the ureter, carrying off the urine, leaves it. In such cases particularly, but sometimes also in the slighter degrees of movable kidney, the patient may be aware of something moving about in an abnormal manner. The causes of movable kidney are not always quite clear. The really floating kidneys are due to the presence of a long stalk or suspensory ligament, which allows a considerable range of movement, but which is not present in ordinary people. Acquired cases are often due to emaciation and disappearance of the pad of fat around the kidney, which helps to keep it in place. Other factors in the production of the condition are: relaxation of the abdominal walls through repeated pregnancies; probably the wearing of high-heeled boots, which puts an abnormal tilt forward in the vertebræ behind the kidneys; and certainly the practice of tight-lacing.

Treatment.—Cases of mild degree will be kept in check and symptoms cured by the wearing of a suitable pad, which may be fitted on to a special belt or may be fixed on under the corsets. It must be thoroughly well fitted, or it may do more harm than good, and should be worn constantly while the patient is up and going about. Violent exercise should not be indulged in, and the straining incidental upon constipation is to be avoided. Indigestion and any signs of general nervous breakdown must, of course, be attended to, if necessary. If the movement is considerable, and particularly if the patient suffers from these attacks of intense pain, or if a pad has been given a good trial and symptoms are still persisting, then the only thing left is to have the offending kidney stitched in place by operation. The operation is an easy one to perform, and is usually very successful.

Stone in the Kidney, or Renal Calculus, and Renal Colic.—Calculi may form in the kidney at all ages, but they are certainly commoner after middle life than at other periods. They are undoubtedly often present even for years without setting up any symptoms whatsoever. At other times their presence may be suspected by the occurrence of pain over the region of the kidneys, and the presence of pus in the urine as a heavy white sediment, and perhaps occasionally of blood—in fact, the features of pyelitis, or suppuration in the kidney. (See below.) In such an instance help is sometimes given by taking X-ray photographs, although, unfortunately, all varieties of stone do not give a shadow with the X-rays. The most definite proof of the presence of a renal calculus is in the occurrence of an attack of *renal colic,* caused by a stone attempting to pass down the ureter from the kidney to the bladder. The symptoms of renal colic are very typical. It begins with pain in one loin, which shoots down into the bladder, and may radiate for a considerable distance along the inner side of the thigh. The pain is exceedingly severe, and is accompanied by a feeling of sickness, often with actual vomiting, and the abdomen on the affected side is tender and held rigidly. The patient is collapsed, the temperature may go up to 102° F. or 103° F., and there is a cold sweat. There is also constant desire to pass water, but only small quantities are passed, containing red blood. Such an attack may be a single event of a lifetime, or there may be recurrences. An attack may last a few hours, or even days. The pain is more or less constant, but there are usually paroxysmal spasms, in which it is much more intense and agonising. The attack ceases when the stone either succeeds in reaching the bladder or passes back into the kidney. Sometimes a stone sticks permanently in the ureter, in which case the symptoms will pass off gradually rather than suddenly, but the features of hydronephrosis may come on. (See below.)

Treatment.—For an attack of renal colic the patient may be put into a warm bath, if he is able to stand the pain of undressing and the necessary movement; if he is not, then cloths or poultices, as hot as can be borne, should be put over the side and front of the abdomen, to relieve the pain and diminish the spasm in the ureter, and so allow the stone to slip down more easily. He may also drink copiously of plain or warm water. A doctor should be sent for, as it is almost always necessary to have morphia administered, and sometimes even chloroform, the pain being so agonising. After the attack is over, the patient should be thoroughly overhauled to see what the nature of the stone is, and as to the likelihood of there being others present. This will include an analysis of the urine, and probably also an X-ray examination. A certain amount can be done in the way of keeping the urine dilute, and so preventing further precipitation, by the drinking of abundance of plain water, and also of alkaline mineral waters such as Ems, Vichy, or Carlsbad, or of water containing a teaspoonful of bicarbonate of potash to the pint. The question of removal of the stone or stones by operation will also have to be considered. Should a stone have become impacted in the ureter, or should there be signs of abscess formation in the kidney, operation is practically essential.

Suppuration in the Kidney.—The symptoms of this are much the same as those of cystitis, or inflammation in the bladder—frequent urination, pus, and perhaps blood, in the urine, fever, and rigors—but there will also be pain, generally of a dull, aching character, in the loins, which is increased by pressure over that region. It may be caused by the irritation of a stone, by the spread upwards of infection from the bladder, by tuberculosis, or by infective agents being carried to the kidneys in the blood. The more chronic forms, such as tubercular suppuration, are often very difficult to diagnose. The condition is a serious one, and, if it cannot be relieved, often causes death through destruction of the kidney and the onset of symptoms of uræmia—*i.e.* convulsions, &c. (See URÆMIA.) The patient will require to undergo a complicated examination under an anæsthetic to see whether one or both kidneys are affected. If only one is involved, then there is a good chance of recovery by removal of the diseased one; but if both are affected, very little can be done.

Hydronephrosis means the distension of the kidney with urine owing to a block in the urinary passages somewhere below the kidney. One or both may be affected. It may be due to a calculus becoming impacted in the ureter, to stricture in the urethra, to enlarged prostate, to the pressure of abdominal tumours, or to twisting of the ureter when there is a floating kidney. Naturally, both will be affected if the obstruction is in the bladder or below it; only one, as a rule, if the obstruction is in a ureter between the bladder and the kidney. The symptoms are not very definite; mild cases often go unrecognised. If more marked, and limited to one side, it may cause nothing more than the development of a swelling in one flank, the enlarged kidney; if the obstruction is not complete, this swelling may come and go with the escape of the urine past the obstruction into the bladder. If both are affected to a marked degree, there will be almost no urine passed, and symptoms of uræmia soon come on. Treatment consists essentially in removal of the obstruction, whenever that is possible. If only one kidney is affected and is much distended, it is sometimes aspirated and the contents drawn off, or it may be advisable to have it removed altogether.

Cysts and tumours of the kidney may occur, but often without any very definite symptoms beyond the development of a swelling in one flank, with dull pain and perhaps blood in the urine. They are not common. Operation offers the only hope of removal.

Uræmia.—See URÆMIA.

Knee, Affections of the.—*Housemaid's Knee.* (See BURSITIS.)

Knock-knee.—See under DEFORMITIES.

Displaced Semilunar Cartilage in the Knee-joint.—See under First Aid Treatment. The condition is also referred to under JOINTS, AFFECTIONS OF THE—*Loose Bodies in the Joints.*

King's Evil.—An old name for scrofula, or tubercular disease of the glands in the neck. (See under GLANDS and TUBERCULOSIS.)

Kyphosis means curvature of the spine with the concavity of the curve directed forwards. (See SPINE, DISEASES OF THE.)

Labour, Complications arising during or soon after.—The management of normal, healthy labour is dealt with elsewhere in the book. It is not very easy to define a normal labour exactly. It is all very well to say that labour should be a physiological process which a woman should be able to go through herself unaided, just as she can carry out the process of digestion unaided; but this does not help us much, nor is it very true when speaking of things as they are amongst ordinary civilised folk. It may be approximately the truth in dealing with savage races and primitive peoples, although even then labour does not always take place without trouble, just as it does not always do so even in the lower animals; but, the more civilised we become, the more difficult does the process of labour tend to become, and the more likely is assistance to be needed, even when matters are going all right. So it comes about that, under the conditions of modern life, some one with knowledge of the difficulties that may arise and more or less skill in dealing with them is usually present, and rightly so. Whatever help is required is needed urgently. There is no time to go searching through books for help in making out what is wrong, and for suggestions as to how to rectify matters; and unskilled interference, no matter how kindly meant, is probably more likely to do harm than good. Under these circumstances, therefore, it is quite unnecessary for us to deal exhaustively with the complications of labour, and we do not propose to do more than refer briefly to some of the more common difficulties, and to point out what may be done (or what should not be done) with safety by those who have no special training or knowledge, and to point out when skilled assistance is urgently required, and merely to mention what measures may then be undertaken. In this way the section may be of some assistance in cases where neither a doctor nor a midwife is at hand; but we would advise that these hints be read over beforehand in conjunction with the management of normal labour, as any difficulty that may arise is likely to be urgent, and should be dealt with promptly, without any unnecessary delay.

Abortion, Miscarriage, or Premature Labour.—Abortion and miscarriage are referred to under the heading ABORTION. Neither in these nor in premature labour is there likely to be any difficulty with the actual labour. The child is so small that the process of expulsion is generally easy. The management is exactly the same as that of an ordinary labour at full time, but naturally the child, if alive, is very delicate, and requires special care and attention. The mother also requires as much attention as after a normal labour; there is a tendency for them to think that, because the process was so easy and lasted such a short time, they can resume their ordinary habits of life almost at once; but this is a great mistake. The womb is, as it were, caught unawares, and often takes actually longer to return to its ordinary condition; and, if time is not given it to do this quietly, there is very likely to be trouble afterwards, with displacements of the womb, &c. So that, to avoid future misery, even greater care should be taken after miscarriages and premature labours than after full-time ones.

Unusual Presentations.—Most commonly the part of the child to be born first—or the "presentation," as it is called—is the top of the head. Not infrequently, however, other parts present, and, although matters may go quite smoothly so, there is rather more chance of trouble than with head presentations. When a *foot*, a *knee*, or *the* *breech* of the child comes down first, the greatest risk is that of undue interference by those in attendance. It is very tempting to pull on the legs with the hope of expediting delivery of the head; but it is the very last thing which should be done, as it is almost certain to make the child's arms go up above the head, or to tilt the head back so that the chin catches, and in either case making further delivery unaided almost impossible, and making the death of the child from compression of the umbilical cord (or navel string) practically certain. The birth of the head may, however, be safely aided, and that very effectively, by firm pressure downwards through the abdominal wall. There is not any particular risk to the mother in labours of this variety, but there is considerable risk of the child being suffocated after the body is born by the umbilical cord being compressed between the head and the walls of the pelvis; it is therefore important to try to get the head out as quickly as possible once the body has been born. Should it unfortunately happen that the arms go up above the head, it is essential to obtain assistance, as considerable harm may be done by clumsy attempts to bring them down; but if help cannot be had soon, the chances of the child surviving are very slight.

Face presentations sometimes occur, but they are hardly likely to be recognised as such except by a medical man, until the head is actually being born and all difficulty is over. In any case the labour is quite likely to proceed all right, although it will probably be rather prolonged, but unskilled interference is not advisable.

A very bad presentation is that termed *transverse—i.e.* when, instead of the head or the feet coming first, the child's shoulder or hand comes down first, the body lying a sort of crosswise in the womb. Delivery is practically impossible, as the body becomes jammed, and manual interference is necessary, or the mother may become completely exhausted by the fruitless efforts of the womb to expel the child. This form of presentation is commonest in premature births and in thin women. The abnormal position of the child can frequently be detected before labour commences by examination through the abdominal wall, and the position rectified. If only recognised after labour commences, it is necessary to have the child turned—not just a very easy procedure, but almost the only way in which delivery can be effected.

It sometimes happens, even in ordinary head presentations, that a *loop of the umbilical cord falls down* past the presenting part, and if it does so the chances of the child dying before it is born are very great. It can sometimes be induced to slip back into its proper place by the mother getting on to her elbows and knees, so that the hips are elevated. If this cannot be done, then pressure on the body of the child through the abdominal wall during each pain, so as to help on its descent, should be tried. The application of forceps and immediate delivery of the child is, however, the method most likely to secure birth of the child alive.

Prolonged Labour.—It is impossible to lay down any definite rule as to how long labour should last, because conditions vary so enormously in different women, but undue prolongation is undoubtedly one of the most serious complications for the mother. Prolongation in the first stage, that in which the mouth of the womb is opening, and the pains are only slight and coming at considerable intervals, is not of much consequence; it is in the second stage, after the child has commenced to descend, that undue prolongation becomes a serious matter. If the pains (accompanying each contraction of the womb) begin to become irregular and feeble, and at the same time the mother's pulse is becoming rapid, the skin hot and dry, sickness appearing and evident exhaustion, artificial aid in delivery is obviously called for. The causes of prolongation of labour are very numerous, and the proper method of dealing with them is not always the same. One common cause is general feebleness of constitution, another the mode of life of the patient, and in this respect women of the working class are much less likely to suffer than those whose habits are more luxurious. Residence in hot or tropical climates is very apt to produce inertia of the womb. In very young mothers there is often delay in the second stage of labour, whilst in women whose first confinement is taking place rather advanced in life it may also be tedious, but by no means so invariably so as is often supposed. Nervousness or depression on the part of the mother is also a fruitful source of delay. It is impossible to give directions as to what will be the best course to pursue in each case; that can really only be decided by the accoucheur on the spot. Sometimes sedative drugs, to give a temporary rest, are best; sometimes stimulating remedies, either to strengthen the patient or to increase the force of the contractions of the womb; in others the administration of an anæsthetic, with or without the application of forceps or hastening of delivery by other means. One thing that may usually be safely done much more systematically than it is, taking a hint from the practices of many nations, is the application of downward pressure over the abdomen along with each pain. This is best done by having the mother lying on her back at the edge of the bed, putting the palms of the hands over the top and sides of the womb, which will still be fairly high up in the abdomen, and pressing firmly downwards and slightly backwards with every pain when the womb is felt contracting. This measure is not to be carried out if much tenderness is complained of in doing it, or if there are not definite pains coming at regular intervals, nor should it be persisted in too long if the mother shows signs of exhaustion, or if it is obviously having no effect in aiding the descent of the child.

In these cases there is probably more than mere prolongation of labour; there may be actual *obstruction*, rendering delivery, except by artificial means, impossible. Such obstruction may be due to deformity of the bones of the pelvis, to tumours of the womb or misplacements of it, to malpositions of the child such as transverse presentations, or to the locking of twins, or to other causes. Many of these can be detected by examination before labour commences, and provided for, but, if not recognised until labour has actually commenced, may give rise to considerable difficulty; but too much effort simply to push the child out will merely hasten exhaustion of the mother. Some of these cases can be delivered by the use of instruments; in others it may actually be necessary to deliver the child by Cæsarean section—*i.e.* through the wall of the abdomen—or the child may have to be destroyed altogether for the sake of the mother, although, if there has been examination of the patient beforehand, this procedure has seldom to be resorted to nowadays, as the induction of labour somewhat prematurely will generally get over any difficulty.

Hæmorrhage before Delivery.—This might properly be described as a complication of pregnancy rather than of delivery, but the condition is conveniently referred to here. Such hæmorrhage may occur any time during pregnancy, but, generally speaking, it is from the sixth month onwards that it is liable to come on. The cause is generally an abnormal site of attachment of the placenta, or afterbirth, to the wall of the womb. Instead of being high up near the top of the womb, it may be low down near its mouth, and the result is that, when the womb contracts and the mouth begins to open, bleeding is liable to occur from detachment of the placenta from its site. The sudden occurrence of hæmorrhage, therefore, without any very obvious cause, any time from the sixth month of pregnancy onwards, should give rise to suspicion of this abnormality. A person with this condition is always in danger of severe or even dangerous hæmorrhage, and the more so the nearer she gets to full time, and it is now almost the universal rule to bring on labour and to deliver the child rapidly when this condition is diagnosed. The risks of temporising in the hope of allowing the child to become more mature are too great. Should a pregnant woman have any hæmorrhage before delivery, she should therefore send for medical assistance as soon as possible, and, till it is obtained and a decision come to as to what is the best procedure, she should keep absolutely quiet, resting on a hard mattress in a cool room, and have cold cloths applied over the lower part of the abdomen and private parts.

Hæmorrhage after Delivery.—This is a much more common condition, and one of the most serious accidents which can occur in connection with labour, "flooding" after the child is born being not infrequently fatal. Nevertheless it is an accident which can to a very large extent be prevented. The chief cause is inertia of the womb after the child is born, so that, instead of contracting firmly, it remains more or less distended, and blood simply pours from it. The conditions which may lead to inertia of the womb at this stage are: exhaustion after a prolonged labour; over-distension of the womb previously, as from twins, &c.; too hurried emptying of the womb with forceps, or in "precipitate" labours, where the whole act is over in a few minutes, as, for instance, sometimes when a woman goes to stool and strains and the child is suddenly born; general weakness or debility, especially from too frequent child-bearing, bad health, or the relaxing effects of a warm climate on European women in the tropics.

A certain amount of hæmorrhage occurs, of course, with every labour, but this is not to be confused with serious flooding, in which blood simply pours from the patient, and, if not checked, is rapidly fatal. The loss of blood may commence immediately after the birth of the child, or it may not begin for some little time afterwards, and it may come on with a sudden gush or gradually.

Prevention.—By simple, proper management of every labour, treating every case, no matter how simple and straightforward it seems, as if it were to be one in which after-flooding were going to occur, this condition can be, in most cases, entirely prevented. From the minute the child is born, for not less than half an hour afterwards, some one's hand should be over the womb, grasping it in the palm through the lax abdominal wall. The womb will be felt every now and again to contract, and at these periods the firmness of the grasp should increase. Between contractions the grasp may be relaxed somewhat, but not sufficiently to allow the womb to relax itself. If the contractions are not felt, occasional firm grasps with the hand will generally succeed in starting them off. The hold on the womb should not be given up until the womb feels as hard as a cricket-ball and of about that size in the hand. As a general rule this will occur within half an hour of the birth of the child. The hand may then be removed and the firm binder applied. If the womb is felt firmly contracted, it is certain that the afterbirth is out of it, even though it may not have been completely expelled from the body, although it usually is so. Sometimes it remains lying in the vagina, in which case it may quite safely be pulled out by the umbilical cord; but traction on the cord should never be employed until the womb is firmly contracted, as there is the risk not only of hæmorrhage, but also of bringing down the top of the womb, turning it inside out. It is also a good practice to give a dose of ergot of rye (one or two teaspoonfuls of the liquid extract) in all cases after the afterbirth has been expelled, to insure persistent contraction of the womb and to lessen the chance of blood-clots being retained in it.

Treatment.—If flooding actually occurs, it is such a terrifying sight that those in attendance are very apt to lose their heads in the excitement, and either do nothing or do the wrong thing. There are various measures which may be employed, all of which have for their object either to set up contractions in the womb or to cause clotting in its vessels. For any one not actually possessed of a midwifery training, probably the best thing to do is to grasp the womb through the abdominal wall, either with one or with both hands, and endeavour, by firmly grasping and kneading it, to make it contract. If this does not succeed in stopping the hæmorrhage soon, then it will be wise to stop bleeding by compression of the abdominal aorta. This vessel, which conveys the blood to all the lower parts of the body, can generally be felt quite easily pulsating just below and to the left of the navel, and, by firm pressure backwards with the flat of the hand or with four fingers against the spine, the bleeding can be stopped. This, of course, does not get at the site of the hæmorrhage, and it is liable to start again when the compression is taken off, but it gains time, and may be kept up, if necessary, for an hour or so, until help is obtained. If much blood has been lost, the patient will be very anæmic and weak for a long time, and will need careful nursing, dieting, rest, and medicines; but it is not necessary for us to go into the details of that here.

There are occasionally other causes of hæmorrhage after delivery, but they are not of sufficient frequency of occurrence nor of such urgency as to demand special description, so that we shall now pass on to the complications which may come on during the puerperium, or period which elapses after the birth until the mother is restored to her ordinary health.

Eclampsia, or *convulsions*, may come on after delivery, just as they may occur during the later months of pregnancy. This condition may come on with very little warning, and is always a serious disease. (See under PREGNANCY, DISEASES OF.)

Puerperal Insanity.—Under the heading INSANITY mention is made of the fact that a certain number of cases of insanity in women are closely associated with child-bearing. Some of these cases commence during pregnancy; usually they take the form of depression or melancholia, but not, as a rule, of a very severe degree, and recovery is the usual result after delivery. The insanity coming on some few months after delivery—the insanity of lactation or suckling—is seldom seen except in poorly-nourished, anæmic mothers. It also takes the form, in most cases, of melancholia, and the treatment does not differ from that of other cases of melancholia. The most trying, but in one way the least serious, form of insanity is that which sometimes comes on within a week or two of delivery—puerperal insanity proper. This more commonly takes the form of mental exaltation or mania. Sometimes it is very wild, and one of the saddest features is the intense dislike that is usually shown to the baby. The child, for the sake of its own safety, must be removed entirely from the mother's reach and sight. Some capable person, preferably a trained nurse, must always be with the mother, as it is not safe to leave her for a single minute alone unwatched, owing to the risk of suicide. The patient may also have violent dislikes of others around her, and is apt to make statements of the most terrible character regarding the character and behaviour both of herself and of others—statements which have, in all probability, not a shadow of foundation of truth in them. Fortunately the outlook in these cases is generally very favourable, recovery being the rule and not the exception. Such patients are seldom, therefore, sent to an asylum, although they must be looked after at home with just as much care as if they were in one. The main points in treatment are: (1) to prevent the patient injuring herself or others, especially her baby; (2) to feed her well; (3) to secure an adequate amount of rest and sleep, the use of hypnotics or sleeping-draughts being nearly always necessary. (See under INSANITY.) The employment of force in carrying out the last two measures is frequently necessary, as the patient will very likely absolutely refuse to touch food or medicine. Relatives and friends have usually to be excluded entirely from the sickroom, as they generally have a much more prejudicial and exciting effect on the patient than strangers have.

Puerperal Fever.—This is not a good name, because the disease is not in any way a definite species of fever peculiar to lying-in women, but simply a form of blood-poisoning arising from infection of the raw surfaces left after birth has occurred. Puerperal septic disease would therefore be a better name for it. It is a condition which at one time was the cause of tremendous mortality amongst the inmates of maternity hospitals, but, since its nature was recognised and proper precautions taken against it, this has fallen to almost nil; but it cannot be denied that the same marked improvement has not taken place in the case of women confined in their own homes. The reason for this is that it is a much more difficult matter to carry out the same antiseptic precautions in a private house, especially in one of the poorer classes, as in a hospital, and, truly speaking, there ought to be just as thorough cleanliness in attending a lying-in woman as in performing a large surgical operation. It is quite true that the weakness and exhaustion of a woman after labour predisposes her to infection, but the infection practically always comes from without; it is not within her own body, and it ought to be prevented from getting into it. Defective sanitation, bad drains, the near presence of others with some septic trouble such as abscesses, sores, boils, erysipelas, &c. &c., are fairly obvious possible causes, and should be removed. Other sources of infection are sheets, towels, or clothes which have been fouled by discharge and are putrefying, or simply clothing which is not clean; but perhaps the commonest source of infection is lack of thorough cleanliness on the part of those in actual attendance upon the patient. More than mere household cleanliness is required—although if this even were always observed much puerperal septic disease would be prevented: surgical cleanliness, the destruction or complete absence of infective germs in everything which comes into contact with the patient, is what is required to stamp out this condition entirely. Not only, therefore, should the doctor and nurse in attendance be careful not to come to the lying-in room from any outside infectious case without having first changed their clothes and disinfected themselves, but the hands must be thoroughly disinfected every time they touch the patient, and all the private parts of the patient should be as completely as possible rendered germ-free before the labour actually begins, by thorough washing and the employment of antiseptic lotions. Any infection which may take place is generally during the labour, although symptoms may not show themselves for a few days afterwards, but the same care must be taken by the nurse in attending to the patient during the puerperium. The symptoms of puerperal fever coming on generally show themselves, within a few days of the birth, in a rise in the temperature and increase in the pulse-rate. These should therefore always be taken and noted down to see that everything is keeping right. There may be little or no pain at first, or, at most, some tenderness over the womb. The patient looks ill and anxious, and there may be slight delirium. Diarrhœa and vomiting frequently come on. The character of the discharge, which is normally present for a week or so after delivery, generally gives important indications. If things are going well, it gets gradually less in amount, and smells fresh and clean all the time; but if there is any septic mischief, it may either cease entirely, or, more commonly, it becomes altered in character, and often takes on a very offensive odour. Some infections are mild and quickly recovered from; others may go on to general blood-poisoning, or set up general peritonitis or other serious complications. The treatment, when a case occurs, consists in the use of antiseptic douches carried right up into the womb by the employment of a suitable tube; sometimes the actual removal of putrefying material from the interior of the womb; and keeping up of the patient's strength until the effects of the poisoning are worn off, with beef-tea, strong meat soups, milk, egg-flip and brandy, and the like, giving the nourishment in small quantities frequently. These are the most generally applicable measures; others may be necessary for any particular case. (See also Blood-poisoning.)

Another, and the last, of the commoner complications occurring after delivery is *white-leg*, a condition due to a clot forming in the veins of the leg. This trouble is most likely to come on about two or three weeks after delivery. It commences with pain in one of the lower limbs, which abates a little in about twenty-four hours, when swelling begins to appear, but remains a distressing symptom throughout the whole of the acute stage of the disease, which generally lasts about ten days or a fortnight. The whole leg or part of it becomes greatly swollen, and is shiny white, tense, and brawny. The veins can sometimes be felt as thick cords, and are specially painful to the touch. The patient is feverish, restless, and sleepless from the pain. When the acute stage is over, the pain and general discomfort abate, and the swelling commences to go down, but it is months before it entirely disappears and the wooden feeling goes quite out of the leg. Sometimes, when all is apparently going well, the condition spreads to the other leg, and any imprudence, such as too much effort at walking in the early stage of convalescence, is very apt to bring on a relapse. The condition is really an inflammation in the veins, or phlebitis, with clotting of the blood in it. The swelling results from the obstruction to the circulation. One of the serious risks of the condition is that a portion of the clot may become detached and be carried to the heart, and stick there or in the lungs, causing sudden death. The conditions which bring about white-leg are not very clear, nor can any special advice be given as to what should be done or not be done to prevent it. As to treatment, there are no active measures possible for the complaint, rest and time being the great healers. Both to relieve pain and lessen the risk of clot becoming detached, rest must be as nearly as possible absolute even in the slightest cases. The limb should be covered with a cage of some sort to keep off the weight of the bedclothes. Poultices will relieve the pain, but they are usually too heavy to be borne comfortably, and flannels wrung out of hot water and covered with oiled silk or macintosh will do better, and, if the pain is very severe, some laudanum or belladonna liniment may be sprinkled on the flannel. During the acute stage the patient should be fed as in the case of a fever. When the acute stage and the pain subside, the fomentations may be discarded, and the limb swathed in cotton-wool and wrapped lightly round with a flannel binder; but any active movements or rubbing must be avoided for some weeks, and the patient must be very cautious and gradual in resuming standing and walking. (See also Veins, Diseases of the.)

Lachrymation.—Excessive running of tears. (See under Eye, Diseases of the—*Epiphora, or Watery Eye.*)

Lameness.—See Gait, Disturbances of.

Laryngismus Stridulus, or *Spasmodic Croup.*—See Croup.

Laryngitis and other Diseases of the Larynx.—See Throat, Diseases of the.

Lathyrism.—See Vetch-poisoning.

Lead-poisoning in its chronic form, from the long-continued absorption of small quantities of lead into the system, is a fairly common condition, and, as the symptoms are gradual in their onset and apt to be confused with ordinary disease, some description of the condition is required here. It is, in fact, one of the well-recognised "trade diseases," and any worker with lead is apt to suffer from it. The occupations in which lead is employed, and in which sufficient may be absorbed to give rise to symptoms, are numerous. They include lead-miners and smelters, painters, pottery workers (who use lead for glazing), typefounders, compositors, enamel workers, plumbers, file-makers, &c. Lead may also get into the system of those who have nothing whatever to do directly with lead in their work, as, for instance, in drinking-water. Water is only likely to take up sufficient lead from the pipes or cisterns to be poisonous when the lead is new, and not covered with the insoluble film which soon forms through the action of the mineral salts which all ordinary drinking waters contain. The waters which have the greatest solvent action on lead, and are therefore the most dangerous, are soft waters, and especially waters coming from some upland peat-covered ground, or water containing organic impurities from, say, any dead creatures which may have fallen into cisterns or reservoirs. The passage of electric currents through the ground where lead pipes are may also cause solution of the lead to occur. Food, when it is preserved in tins, may also become contaminated with lead from solder, but this is really a very uncommon form of poisoning. The lead or the tin often gets blamed, but in reality, in most cases of "tinned food poisoning," the fault has lain in the food being bad before it was put into the tin. Cider made in leaden presses used to be a frequent cause of lead-poisoning, the condition going by the name of "Devonshire colic"; but very little, if any, cider is made in this way nowadays. Lead is also a constituent of certain preparations which are taken for the purpose of procuring abortion, and, before abortion can be brought about, sufficient lead is almost always taken to cause symptoms of general poisoning.

Symptoms.—Amongst the early features are constipation, muscular weakness, and a degree of pallor or anæmia. When well developed there is not only constipation, but frequent attacks of severe colic. Another important sign, especially from the ease with which it can be made out, is the development of a blue line on the gums at the junction of the gums and the teeth. It is quite a narrow line, and is not always opposite all the teeth, being usually best marked opposite those which are encrusted with a good deal of tartar. It is caused by the formation of sulphide of lead in this situation. The muscular weakness is generally most marked in the hands; it is due to an actual inflammation of the nerves, or neuritis, and often goes on to complete paralysis and wrist-drop. There may also be tremors in the weakened muscles, but there is not usually pain with this form of neuritis. The lips and tongue may also show tremors. More rarely the muscles of the upper arm or of the leg may become wasted and paralysed. Other occasional features are headache, convulsions, pain in joints, gouty symptoms, dropsy, and the development of a form of chronic Bright's disease, with thickened arteries and hypertrophied heart.

Treatment.—With regard to prevention, the risks are now generally well known amongst workers with lead, and there are efficient regulations in most trades dealing with the use of respirators where there is a liability to inhale the dust of white-lead, and the necessity of cleanliness, changing of clothes, and washing all lead off the hands after work is over. The routine employment of small doses of Epsom salts, which precipitates any lead in the stomach in an insoluble form, so that it cannot be absorbed, is also to be recommended. In connection with lead in drinking water, the greatest amount is most likely to be in water which has stood overnight in contact with the pipes or cistern, so that it is always advisable to run off a considerable amount of water in the morning before taking any for drinking or cooking purposes. This is more particularly the case when the lead is only recently put down, and where the water is very soft. When symptoms of lead-poisoning are actually present, iodide of potash is generally administered, as it dissolves lead without at the same time tending to re-deposit it in new places. From 3 to 5 grains are usually taken as a dose; one may therefore, for convenience, get made up a bottle containing 144 grains in 6 ounces of water, and take a teaspoonful of this thrice daily after meals. If there is much colic, a few drops of laudanum may be required for the pain. The weakness or paralysis of the muscles should be treated by massage and electricity, just as in the case of other forms of paralysis. (See under PARALYSIS.)

Lens of the Eye.—Affections of the lens are dealt with under CATARACT, and under EYE, DISEASES OF THE, especially *Errors of Refraction.*

Leprosy.—A disease whose history is as old as that of the written history of the human race. It is a chronic, slowly-developing, and long-lasting disease, but one producing horrible and characteristic deformities. The first definite sign of leprosy is usually the development of red, smooth, shiny patches on the skin, and, which is most typical, the centre of these patches will be found to be anæsthetic or insensitive to touch. Later on the development may take place in one of two directions—viz. to the nodular form, in which nodules grow under the skin, especially the skin of the face; or to the nerve form, with increase in the size of the early patches, complete loss of sensation, contractures, dropping off of fingers, &c.

The disease is now widely distributed in tropical and sub-tropical countries, but it is not essentially a disease of warm climates, for in Europe its only stronghold is now in the countries around the Baltic, especially Norway, and also in Iceland. It is found all over tropical Asia, the whole of Africa, but especially Northern Africa, the Malay Archipelago, some of the Pacific Islands, Mexico, West Indies, Central America and many parts of South America, and some parts of the United States. The specific cause of leprosy is now admitted by all to be a particular germ, the *Bacillus lepræ*, but as to how infection with this organism occurs there is not the same unanimity of opinion. Probably many cases are infected through abrasions of the skin or mucous membranes. Corroboration of this idea is found in the fact that, where persons go habitually barefooted, the disease often appears first in the feet. Ulceration in the septum of the nose appears to be another common starting-point. The infection may probably also be transmitted through the bite of various insects which prey upon man, and also through sexual intercourse with a leper. The contagiousness of leprosy is very feeble, the immunity of doctors and nurses attending lepers being proverbial, but long and intimate contact may lead to contraction of the disease. Hereditary influence plays little part in its spread, although, of course, the children of lepers, if living with their parents, may readily get infected in some way or other. Diet is believed by some to be an important factor in the spread of the disease, especially the use of tainted fish, but there is not conclusive proof of this view, although there is a good deal to support it.

The earliest symptoms of leprosy are attacks of feverishness, lasting for a few days, pains in the head and joints, sweating, and bleeding from the nose. This sort of thing may occur at intervals for a few months or even a year or two, until, after one of the feverish attacks, an eruption of the typical patches comes out on the skin, possibly all over the body, but usually most marked on the face, backs of the hands, and forearms. The patches come and go at first, but subsequent crops tend to remain and to become darker in colour, and the skin becomes thickened. If hairy parts of the body are involved by the patches, the hair is either lost or becomes white and downy. Next follows the formation of the leprous nodules, either under the skin in the nodular form, or specially in the nerve trunks in the nerve or anæsthetic form of leprosy. These two main forms may, however, occur mixed in the same patient, and all cases tend ultimately to show features of both kinds; but, for purposes of description, it is convenient to describe them separately. In the nodular form there appear and slowly grow under the skin tough, flattened, painless, freely-movable nodules of a rubbery consistence. The face and ears are generally the parts first affected, and the nodules grow until large folds and masses of tissue are formed, giving rise to the lion-like face of leprosy. Then other parts are involved, until practically the whole body may be affected. Sooner or later ulceration occurs in these nodules, and hideous sores form. The patient may live for years, death ultimately occurring from exhaustion or from some other disease altogether. The nerve or anæsthetic form shows rather a different picture. The nerve trunks are the chief seat of the nodule formation, and there is at first neuritis, with pain of a severe neuralgic character, then the development of large areas of numbness, or even complete loss of sensation of all kinds. The early patches on the skin persist, becoming darker and darker in colour, and quite insensitive to touch or pain. Contractures, wasting of muscles, and sloughing off of fingers or toes also occur. This type is generally very chronic and long-lasting. Cases of any sort may apparently become arrested and cease to become worse, but it is very doubtful if any actual cure ever occurs. The only satisfactory mode of preventing or limiting the spread of leprosy is by segregation of all affected persons; but so far attempts to do so have met with great opposition, and it is manifestly a difficult problem where large numbers are affected.

Treatment.—At present no remedy can be said to have any certain effect in staying the progress of the disease. Probably the most important thing, both for the patient and for the community, is to put the leper in as good general health and in as healthy surroundings as possible, and to use every available means of enforcing personal cleanliness, so as to prevent gross spread of discharges from sores contaminating the soil, &c., and being the cause of further cases. Ulcers require to be dressed and kept clean, just as any other ulcer does. Special surgical measures may be required under certain circumstances, as, for instance, when the disease spreads on to the eye or into the larynx.

Leucocythæmia.—See under BLOOD, DISEASES OF THE, also GLANDS, DISEASES OF THE.

Leucoplakia.—See under MOUTH AND TONGUE, AFFECTIONS OF THE.

Leucorrhœa, or *Whites.*—See under WOMEN, DISEASES PECULIAR TO.

Lice.—See PARASITES.

Lichen.—See under SKIN DISEASES.

Lienteric Diarrhœa means diarrhœa occurring shortly after every meal. (See under DIARRHŒA.)

Lightning Pains.—The name given to severe shooting pains felt, as a rule, down the thighs, in locomotor ataxia, often being one of the early symptoms. (See LOCOMOTOR ATAXIA.)

Limp.—See GAIT, DISTURBANCES OF.

Lipoma.—A tumour composed mainly of fat. Such tumours arise usually under the skin, and may attain large size, but do not usually give rise to trouble beyond the discomfort or inconvenience of their size and position. Removal by operation may be advisable.

Lips, Affections of the.—*Cracked lips,* or *fissured lips,* are apt to occur in cold weather. Moistening of the lips with the tongue, although giving temporary relief from the discomfort and very difficult to withstand the temptation of doing, tends to make the condition worse and keep the cracks from healing. As a rule the cracks will heal if the lips are kept covered with some simple ointment, such as boracic ointment or vaseline. If deep fissures with hard edges form, they may be very obstinate to heal, and frequently require touching with some caustic, such as nitrate of silver. It is advisable to get a doctor to do this.

Herpes labialis or *water blisters* on the lips often form when a person is suffering from a cold or any feverish affection. They will generally heal quite quickly even if untreated, but are better to be smeared with vaseline or boracic ointment.

Ulcers on the inner aspect of the lips may form in connection with decayed teeth or in persons with indigestion. The treatment for the ulcer itself is to wash out the mouth frequently, and swab over the ulcer with a little cotton-wool soaked in a mixture of some antiseptic such as "phenol sodique," equal parts of boroglyceride and glycerine, or a tablespoonful of glycothymoline in a cupful of warm water.

Cancer of the lip usually occurs on the lower lip, beginning about the junction of the red part with the skin. It is nearly always seen in men in middle life or over it, and is often attributed to the irritation caused by smoking a clay pipe or from a sharp edge of a tooth. At first it appears as a small ulcer, the edges of which are rather hard and firm; and any ulcer appearing under such circumstances should be looked upon with suspicion, and a medical man consulted. If recognised early, this is a very favourable form of cancer, as the disease can usually be completely removed by operation.

Hare-lip.—See under DEFORMITIES.

Liver, Diseases of the.—The liver, although a large, is a comparatively passive organ, and may be considerably disturbed in its functions without giving rise to very urgent or striking symptoms. One of its most important duties is to act as a sort of sieve, and filter out waste products or deleterious substances from the blood; if this function is upset, the person is often spoken of as feeling "liverish" or "bilious," a very good description. The fault, however, in such a case does not usually lie with the liver itself, but in the fact that the sieve has been choked or overburdened with material coming from the stomach and bowels, and, being unable to deal with such a quantity of more or less poisonous material, some of it remains in, or is allowed to pass into, the circulation, giving rise to the uncomfortable sensations and general feeling of malaise or of being upset which is described by the terms mentioned. The proper treatment for this condition is to attack it at the fountain-head, with such measures as are described under DYSPEPSIA and CONSTIPATION. "Liver pills" are frequently taken. They may owe their virtue, to a slight extent, to stimulation of the liver to excrete more bile; but in the main they do their work, and do it very well, by their direct action on the bowel as purgatives.

Another important function of the liver is the secretion of bile. If this is interfered with in any way—which it may be, either inside the liver itself or in the gall passages between the liver and the bowel—jaundice will follow. (See JAUNDICE. For the allied condition of gall-stones, see under GALL-BLADDER AND DUCTS, DISEASES OF THE.) The liver also plays a certain rôle in acting as a storehouse for the carbonaceous portion of the dietary, and disturbance of this may sometimes be a factor in the production of diabetes, although no direct treatment of the liver is known to have any effect upon this condition. (See DIABETES.)

Obstruction of any sort to the circulation through the liver leads mechanically to the development of ascites, or localised dropsy, in the abdomen. (See DROPSY, and also some of the conditions mentioned below.)

These are some of the more important general symptoms produced by liver diseases. We now come to discuss its affections more particularly.

Abscess of the Liver.—The commonest form of this is the so-called "tropical abscess," a condition which may follow upon dysentery, from the spread of the amœba or parasite which causes dysentery from the intestine to the liver. It may come on—or, at all events, first give rise to symptoms—long after the original attack of dysentery is recovered from, months or years even. Even then the symptoms are not always very pronounced, and sometimes the first evidence of its presence may be rupture of the abscess into the peritoneum or through the diaphragm into the right pleural cavity or lung, or the discharge of large quantities of pus through the lung by coughing. Apart from such a sudden revelation of abscess formation in the liver, the symptoms which such a condition are likely to give rise to are: fever of an irregular or intermittent type; general weakness; loss of strength and dyspepsia; enlargement of the liver, so that it can be felt well below the margin of the ribs; and attacks of pain under the lower ribs on the right side, and also through to the back in the region of the right shoulder-blade. Jaundice is not common. In bed the patient will generally be found to lie on the right side, with that shoulder drawn down and knee drawn up, so as to relieve the tension in the muscles running over the liver. Such symptoms in a patient who gives a history of a previous attack of dysentery justify the introduction by a surgeon—with strict aseptic precautions, of course—of a needle to see where the abscess is exactly, and, when it is found, it must be opened and drained. Such amœbic or tropical abscesses do sometimes develop without any previous attack of dysentery, and abscesses may also form in the liver from other causes, such as suppuration in the gall-bladder or in general blood-poisoning. In the latter case operation is of no use, and little can be done for the patient; in the former the symptoms and treatment are similar to those of tropical abscess.

Cirrhosis of the liver, also called *hobnailed liver* or *gin-drinker's liver*.—This is a disease of the liver which comes on as the result of chronic over-indulgence in alcoholic liquors, and also in other chronic intoxications, of which lead is perhaps the most important. It has also been known to come on in people who are addicted to the use of pepper in enormous quantities. The liver becomes much diminished in size, and much of the liver tissue is replaced by fibrous bands running all through its substance. These give the surface of the organ an irregular knobby appearance, like that of the sole of a boot shod with hobnails, hence that name. The symptoms are to a large extent dependent upon the obstruction to the circulation through the liver. From the backward congestion in the veins of the stomach the patient develops a chronic gastric catarrh, with indigestion, a feeling of discomfort in the pit of the stomach, and, most characteristic of all, morning sickness and vomiting. Hæmorrhage into the stomach and vomiting of blood are also not uncommon, and blood may also appear in the stools, giving them a black, tarry appearance. The patient is likely to lose strength and weight. Piles often form from the congestion in the veins of the bowels. Ascites, or dropsy of the peritoneal cavity, with great distension of the abdomen, is almost certain to be present. Large distended veins can often be seen on the surface of the abdomen, showing that the blood is getting back to the heart through other unusual channels. The skin often becomes sallow and yellowish, but only rarely distinctly jaundiced. From the causation of the disease it will be apparent that the subjects of it occur principally among men in middle life who have been for long steady soakers of drink. The onset of the symptoms is slow and gradual.

Treatment.—The mode of prevention of the disease is obvious, but, once the liver has become cirrhotic, nothing can put it back in its original state. The most that can be done is to relieve symptoms. Naturally alcohol should be stopped, so as to prevent things from becoming worse. The bowels should be kept moving fairly freely by taking daily a glassful of hot water with a table-spoonful of sulphate of soda dissolved in it. While this is acting, two or three drops of Fowler's solution (an arsenic preparation for which a doctor's prescription will be required) may be taken to relieve the nausea and give an appetite for breakfast. Light, easily-digestible food should be taken, and the use of a little bicarbonate of soda at or after meals is frequently beneficial. Ascites requires treatment by tapping of the abdomen and drawing off the fluid. Naturally this should only be done by a doctor. It may have to be repeated frequently. Of recent years an operation, which has for its aim the establishment of better side channels for the circulation, has sometimes been performed, but the results cannot be said to be very encouraging.

There is another form of cirrhosis, in which the liver gets larger instead of smaller, jaundice develops, and there is no ascites. The cause of this form is unknown. There is always considerable indigestion, and this is the only symptom which is amenable to treatment. (See DYSPEPSIA.)

Congestion of the Liver.—See TROPICAL LIVER.

Tumours of the Liver.—The commonest tumour in the liver is cancer; it is rarely primary, usually secondary, to cancer in some other situation, such as the stomach, pancreas, intestines, or even the breast or womb. The condition is quite inoperable when the liver has become involved; practically the only thing that can be done is to relieve the pain which is almost constantly present, and for this morphia is generally required. The symptoms of cancer in the liver are emaciation, enlargement of the liver, so that it may stand out prominently below the ribs on the right side, and nodules of tumour can often be felt through the abdominal wall on its surface. There is frequently, but not always, jaundice.

Hydatid Cysts in the Liver.—The liver is one of the commonest sites of hydatid cysts to form. (See under PARASITES.) This is a condition which is common amongst people who have to do with sheep and sheep-dogs, being due to a special kind of tapeworm, which passes part of its existence in them. A cyst in the liver may be present for long without symptoms, but it may cause jaundice or obstruction to the circulation through the liver, and distinct enlargement of the organ. The characteristic thing about the swelling which it produces is that a thrill or wave of fluctuation can be obtained by placing one hand on one side of the swelling and tapping with the finger on the other. When giving rise to any trouble from their size or from pressure, or when suppuration occurs in them (with all the signs of the formation of an abscess), they may have to be removed by operation; otherwise there is no treatment.

Other diseases of the liver are either so rare or give rise to so little in the way of symptoms that they do not require mention.

Liver-flukes are parasites which are very common in sheep, and very occasionally they occur in man in the bile passages, but even then, as a rule, only in small numbers, and they do not give rise to much trouble beyond a little jaundice. (See PARASITES.)

Lockjaw, or Tetanus.—A disease due to the entrance and development in the body of a specific germ, the tetanus bacillus, which sets up rigidity in the muscles, so that the limbs become fixed and the jaw locked. The bacillus is a prevalent one in garden soil, and about stables and dungheaps, all over the tropical and temperate zones. It gains entrance into the body through wounds or scratches in the skin. Wounds in the fold between the thumb and forefinger are sometimes supposed to be specially dangerous ones; they are not really so, except that that is quite a likely situation for contamination with earth containing the bacilli to occur. Considering the widespread abundance of the bacillus, tetanus is not really a very common disease, but cases crop up every now and again among gardeners, stablemen, children running about barefooted, &c. Regular epidemics have also occurred amongst new-born infants, the infection taking place at the navel.

Deep punctured wounds are the most dangerous ones, because the tetanus bacilli are what is termed "anærobic" organisms—*i.e.* they grow best away from air—so that any such wound likely to be contaminated is best laid open, thoroughly washed out, and freely drained, so as to prevent the growth of the germs at the bottom of it. The germs are particularly resistant, as they form spores which can stand even boiling for a short time without being killed. To prevent their spread, therefore, all discharges from an infected wound should be burnt. The symptoms are due to the absorption of a toxin or poison formed by the germs in the wound, and its influence on the nerves and spinal cord and brain sets up the rigidity and spasm in the muscles.

The symptoms come on, as a rule, when the wound is healing, and there may be very little sign of irritation about the wound itself. The first symptom is usually some rigidity or stiffness in the muscles about the wound, then the characteristic stiffness comes on in the muscles of the neck and jaw, leading to inability to open the mouth; hence the name "lockjaw." The rigidity may then spread, in the course of a day or two, over the muscles of the whole body. The muscles are all the time rigid and partly contracted, but at intervals there is a partial relaxation, and then spasmodic contractions, giving rise to the convulsions of the disease. Such convulsions are liable to be produced by any little stimulation, such as a breath of cool air, the noise of a door banging, a bright light, or an effort to move. They give rise to fearful contortions and great suffering on the part of the patient. Spasm in the facial muscles gives the face an expression of painful mirth, which has been termed the "risus sardonicus," and sometimes the first clue to the nature of the disease has been got from this coming on when the doctor has asked the patient to show his tongue. Contraction of the back muscles may arch the body so much that it rests only on the heels and the back of the head. The mind usually remains quite clear. The temperature is raised in proportion to the severity of the convulsions, being anything from 100° F. to 106° F. The attack is an acute one, and may either pass off in a few days, or death may occur in anything from two to six days. Death is due either to exhaustion, or to asphyxia from the spasm so affecting the muscles of respiration that the patient cannot breathe. The disease can hardly be mistaken for anything else except possibly strychnine poisoning or a severe hysterical attack. In strychnine poisoning the symptoms are very similar, but they come on very much more rapidly, and between the periods of spasm there are periods of complete relaxation of the muscles, which is never the case in tetanus. Hysteria does sometimes produce similar severe spasms, but the patient is generally a woman, and will be laughing and crying, and waving or shaking the limbs, as well as having spasms of rigidity in them.

Treatment.—As far as possible this should be preventive, by thorough cleansing of all wounds, particularly of any likely to contain earth or obtained about a farmyard. Even a slight scratch should be washed clean, preferably with some antiseptic lotion. This applies, of course, not only to the prevention of tetanus, but also of other forms of blood-poisoning. If a deep wound, it is better, as has been said, to have it laid open, so that it heals up from the bottom. If symptoms of lockjaw have actually developed, the area of the wound is usually cut out altogether. The most efficacious measure in the treatment of the actual disease is tetanus antitoxin, prepared from artificial cultures of the germ. To produce good results the use of this should be begun on the very first evidence of the disease, before the toxin has entered into firm combination with the brain and spinal cord substance. The antitoxin is injected either into the nerves or actually into the spinal cord or brain. Its early use has rendered lockjaw a much less fatal disease than heretofore, but the disease is still a very fatal one if symptoms are well developed before the use of antitoxin is commenced. In the United States, where there used always to be a regular epidemic of tetanus from toy-pistol wounds after the Fourth of July celebrations, antitoxin is frequently injected in such cases without waiting for the development of actual symptoms, but merely as a preventive measure, with the result that cases have become very much less frequent. If antitoxin cannot be obtained, or if its use has been begun rather late, sedatives must be employed to diminish the severity of the convulsions, large doses of such drugs as chloral being most usually given. The avoidance of any draughts, loud sounds, or bright light is also an important measure to ward off the convulsions. The patient has sometimes to be fed through a tube passed down the nostril, owing to the impossibility of opening the mouth. The bladder must also be watched, as retention of urine is not uncommon, rendering it necessary to have a catheter passed.

Locomotor Ataxia.—Also known as *tabes dorsalis*, the subjects of the disease being called tabetics. This is a chronic disease of the nervous system, in which the chief amongst the early symptoms are: a tendency to swaying or losing one's balance when standing, especially with the eyes shut or in the dark; a peculiar gait, in which the legs are thrown too far forwards and the soles of the feet brought down with a thump on the ground; and the occurrence of severe lightning pains, shooting down the thighs or as a girdle round the body. There are numerous other symptoms, which come on later in the course of the disease, and render it a very easy one to recognise when fully developed, but those mentioned are usually the features which will first draw the patient's attention to the fact that something is wrong.

The disease occurs far more commonly in men than in women, coming on most often between the ages of thirty and forty. The most important factor in the causation of locomotor ataxia is syphilis. The disease cannot be regarded as actual syphilis of the nervous system, but rather as a remote result of syphilis, seldom coming on sooner than five years after acquiring syphilis, and often much later. As in the case of general paralysis of the insane, which is also an after-result of syphilis, and which may be combined with locomotor ataxia, we do not know what are the other factors necessary for the development of the disease. In the case of locomotor ataxia, at least, it is probable that it may develop without previous syphilis in some few instances. The chief seat of the disease in the nervous system is in the posterior columns of the spinal cord and in the nerve roots carrying sensation, especially those sensations coming from muscles, and it is the lack of these which gives rise to the peculiar gait and the swaying. There is no real paralysis or weakness of the muscles, but, as the individual's brain does not receive messages from the muscles when any movement takes place, he does not know, as it were, where his limbs are, and therefore the movements are erratic, or, as it is termed, inco-ordinated.

Symptoms.—The loss of co-ordination in the muscles is sometimes first noticed by the patient losing his balance and tending to fall forwards when washing, because the eyes are shut then and cannot be employed for controlling his position. In addition to the peculiar gait, difficulty in picking up small objects or in fastening buttons may be noticed, or, in lifting food to the mouth, the spoon may be carried somewhat wide of the mark. The severe lightning pains felt in the legs or as a girdle pain are apt at first to be mistaken for sciatica or lumbago. Severe attacks of pain may also occur from time to time in the stomach, usually accompanied by severe vomiting. These attacks are spoken of as "gastric crises." More rarely, similar crises may occur in the bladder or in the rectum. Other sensory symptoms are curious feelings, such as of creeping or tickling sensations in the skin of various parts of the body, or of intense sensitiveness of the skin, so that the slightest touch may feel painful. A feeling as if the person were walking on cotton-wool is also frequently noticed. When the disease is further developed, these sensations usually give place to areas of anæsthesia, or loss of sensation to touch or pain. Such areas have generally to be looked for, however, as the patient seldom notices them himself. Another symptom which has to be tested for, but is extremely typical of tabes, is the loss of the knee-jerks—that is to say, when one leg is crossed over the other, and the tendon below the knee-cap sharply tapped, there is no jerk or throw-up of the foot as occurs in health. This sign is usually present very early in the disease. In the eyes an important and very constantly found symptom is the presence of an Argyll-Robertson pupil—*i.e.* the pupil does not contract when exposed to a bright light, but it does contract when the patient looks suddenly from a distant object to one held a few inches in front of the eyes. Blindness from atrophy of the optic nerve is a feature which comes on in a certain number of cases. The bladder often gives rise to trouble; either there is difficulty in commencing the act of emptying it, or there may be sudden stoppage in the middle of the act, and the imperfect expulsion is apt to lead to retention of some of the urine, and cystitis or inflammation of the bladder. Various other symptoms occur sometimes, but all the more important features of the disease have been mentioned.

With regard to the outlook in this disease, it must first be said that recovery cannot occur, but the progress of the disease is a very slow one, and patients may live for many years. Some cases, in fact, do not progress at all; a few symptoms may be present, but the condition never becomes any worse. Suitable treatment can also, in the majority of instances, arrest the progress of those cases which are getting worse. It is noteworthy that in those cases which become blind there is seldom any subsequent advance in the other symptoms.

Treatment.—To begin with, the blood of the patient is now generally subjected to a chemical test to see whether there is still any of the virus of syphilis in the system, and, if there is, a few months' anti-syphilitic treatment with remedies such as mercury and iodide of potash is necessary. (See *Syphilis*, under VENEREAL DISEASES.) Subsequent shorter courses of this may be necessary at later periods, especially if the disease is progressing at all. Apart from such measures, the most important point is the re-education of the muscles to work properly together, and this is done by devising suitable exercises, which gradually increase in complexity as the patient's powers of co-ordinating his movements improve. Thus he may be made to walk along a chalk line on the floor, to walk so that the feet are placed on certain marked spots on the floor, &c. &c. The exercises will have to be devised with the doctor's help as suitable for each particular case. Care must be taken, in the first burst of enthusiasm, not to overdo them. They should never be indulged in until the patient is tired; rather let them be practised for short periods several times a day. All exercise taken by the patient should be subject to the same reservation. Baths, electricity, &c., are sometimes employed; they may have a soothing influence, improve the general health, and make the patient feel that something is being done, but it is doubtful if they have any great influence upon the disease itself. For the pains which are often so pronounced, especially early in the course of the disease, the best remedies are the coal-tar products, phenacetin, antipyrin, &c. For remarks concerning their use, dosage, safety, &c., see under HEADACHE. For the blindness, unfortunately, nothing can be done.

Loins, Pain in.—See under BACKACHE; KIDNEYS, DISEASES OF THE; and LUMBAGO.

Loose Bodies in Joints.—See under JOINTS, DISEASES OF.

Lordosis means unnatural curvature of the spine forwards. (See SPINE, DISEASES OF THE.)

Low Fever.—A vague term, generally, however, meaning a slight malaria attack. (See MALARIA.)

Lumbago.—Pain and stiffness in the muscles of the small of the back. Attacks of this condition, which may be very severe and sudden in their onset, are liable to come on after a wetting or exposure to cold, especially after exercise in which stooping involving the back muscles has been indulged in—*e.g.* gardening. As a result, any turning or bending may be excruciatingly painful. The condition is often regarded as a form of muscular rheumatism, but it is very doubtful if this condition is in any way allied to rheumatism as it affects the joints. One or both sides of the back may be affected, and any coughing or sneezing may be so painful that the patient is afraid to move or draw a deep breath. The lightning pains of locomotor ataxia are sometimes mistaken for lumbago. (See LOCOMOTOR ATAXIA.)

Treatment.—Salicylates, such as 10 grains of salicylate of soda as a powder thrice daily after meals, are frequently taken on the supposition that the affection is a rheumatic one, but in most instances without much benefit. In cases coming on after exposure to cold, a very hot bath, a Turkish bath, or a hot pack (flannel wrung out of boiling water, applied at once over the back, and covered over with a good thickness of dry blanket or towel) will often relieve the pain and stiffness, especially if combined with as hard rubbing or massage as can be endured. Another old-fashioned remedy consists in ironing the back with a hot iron, one or two layers of brown paper being put between the iron and the skin. Vigorous rubbing with embrocation or with turpentine liniment is also frequently used. In cases which come on very acutely, and also in chronic cases, the best and most rapidly acting measure is to have several needles inserted through the skin into the muscles, and left in for about a quarter of an hour. The needles and the skin must, of course, be properly sterilised. After being once shown the method of doing this, the patient's friends can be taught to do this themselves if necessary. In cases that last any time the bowels should be kept moving freely by the use of some saline aperient, such as a dessertspoonful of sulphate of soda in a tumblerful of warm water every morning. (See also under BACKACHE.)

Lumpy Jaw.—See ACTINOMYCOSIS.

Lunacy.—See INSANITY.

Lungs, Diseases of the.—Some of the general symptoms produced by diseases of the lungs, and a number of the more important conditions affecting these organs, the bronchial tubes leading to them, and the pleural membranes covering them, are dealt with separately under the headings BRONCHITIS, CHEST DEFORMITIES, CHEST DISEASES, CHILLS, COLDS, COUGH, CONSUMPTION, EXPECTORATION, HÆMORRHAGE, PLEURISY, and PNEUMONIA. It only remains here to discuss other diseases of the lungs which may be regarded as less important, either because they are less common, or because they are rather of the nature of complications of those affections dealt with separately, or because they are not so serious.

Abscess of the Lung.—This may arise from the extension of a neighbouring abscess into the lung, such as a tropical abscess in the liver. The commonest cause, however, is the breaking down of a portion of consolidated lung, such as takes place sometimes after a pneumonia which does not clear up properly. Multiple small abscesses may occur in blood-poisoning. Any abscess may be associated sooner or later with gangrene. The previous history of the patient is therefore of importance in coming to the diagnosis of abscess formation in the lung. The symptoms which will lead to a suspicion of it are the persisting presence of very foul breath and the coughing up of large quantities of stinking, purulent expectoration. The patient has usually a hectic, swinging temperature, sweats abundantly, and looks very ill. The examination of the chest by a doctor will probably give him evidence of the formation of a cavity in the lungs, but it is not always easy to distinguish this from the cavity formation which occurs in consumption or in dilatation of the bronchi (bronchiectasis). Failure to find tubercle bacilli in the sputum would be an important point against its being a consumptive cavity. The condition is often a serious one. Sometimes when the abscess opens freely into a bronchial tube the matter may be all discharged, and healing occurs, but more often the tendency is for it to go on constantly discharging and gradually sapping the patient's strength. Operation—opening into the abscess through the chest wall, and thorough draining of the abscess cavity—probably offers the best chance of recovery, but such an operation is always rather a dangerous one. Quinine is about the only drug which is of much service, and is usually given to counteract the ill-effects of the absorption of poisonous material from the abscess. A teaspoonful of the ammoniated tincture may be taken thrice daily.

Bronchiectasis.—A condition of dilatation of the bronchial tubes from long-lasting coughing, such as in chronic bronchitis or in the healing and shrinking which goes on in very chronic forms of consumption. One or more of the tubes widens out into a large cylindrical cavity. Secretions accumulate in this, but are emptied from time to time by fits of coughing; and these severe attacks of coughing, bringing up large quantities of somewhat fœtid sputum, are the chief symptom. The condition is not easily distinguished from abscess, and from chronic consumption with cavity formation in the lung substance, but it is not such a serious condition, because, although complete recovery is rare, it is compatible with considerable prolongation of life, although there is always a risk of the patient becoming exhausted by the absorption of poisonous material from the contents of the dilated tubes. The treatment is practically the same as that of chronic bronchitis (which see), along with measures directed towards diminishing the septic character of the secretions accumulating within the dilated tubes. The method which the patient can best carry out himself is the inhalation of some antiseptic substance, such as carbolic acid, creasote, or turpentine, either as a spray or by a volatiser. Failing any apparatus, a few drops of creasote may be put into a jug of boiling water, and the steam and creasote vapour inhaled several times a day. Direct injections of antiseptics down the windpipe by means of a syringe and suitably curved long nozzle probably give the best results, but naturally the patient cannot do this himself.

Broncho-pneumonia.—See *Inflammation of the Lung.*

Collapse of the Lung.—Portions of a lung or of both lungs may collapse from the pressure of a large effusion in pleurisy (see Pleurisy), or from blocking of the air-passages so that air does not get into that portion of lung. Blockage may occur from the extension downwards into the bronchi of the membrane in diphtheria, but the commonest cause is probably excessive secretion in the tubes themselves, without strength to cough it up. This is apt to occur in children and old people, especially in bad bronchitis and in the extension of this into the lung as catarrhal, lobular, or broncho-pneumonia. (See *Inflammation of the Lung.*) When a large area of lung collapses, there will be great breathlessness; but if the patient's chest be watched, there will be noticed to be parts, generally low down on the chest, which do not move or expand, as there is no air entering the lung under them. The patient will also become very cyanotic, or livid in colour. The condition is a very serious one, and, if the collapse is extensive, recovery is hardly likely to occur. The first effort in treatment is to endeavour to get rid of whatever is causing the collapse. In pleurisy with effusion this is done by tapping the chest and drawing off the fluid. In blockage of the bronchi, emetics are frequently given, the straining of vomiting clearing out the bronchial tubes also. Thus, in children a teaspoonful of ipecacuanha wine may be given. This is somewhat depressing, and stimulation is necessary afterwards to encourage deep respiration, so as to re-expand the collapsed portion of lung. Such drugs as alcohol, ammonia, and strychnine are therefore employed. In children, from a few drops to half a teaspoonful of whisky or brandy may be given in a little warm milk every hour or even half-hour, or 10 to 20 drops of sal volatile similarly. In adults larger doses will be necessary. Strychnine is best given hypodermically by the doctor; it is a drug which has a very powerful action in stimulating the respiration. Children are better not left lying too long in one position, as the secretion only tends thus to accumulate in the bronchi; they should be taken up and carried occasionally. The application of a mustard-leaf to the chest, or other form of counter-irritation, such as rubbing with camphorated oil, should also be persevered with, while it is exceedingly important to see that there is no tight or heavy clothing over the chest interfering with breathing. Heaping on of clothes, under the mistaken impression that the child must be prevented from catching cold, is quite unnecessary, when the child is probably already very hot and feverish, and only does harm by making breathing more difficult.

Congestion.—This term is used in two entirely different connections. In its ordinary popular use it means an *acute congestion*, which is equivalent to the first stage of inflammation of the lungs, and it may be used in this sense by a medical man when speaking of a very mild attack of inflammation, which practically does not go beyond what is the early stage of a severe attack, and from which the patient quickly recovers. (See *Inflammation of the Lung* and Pneumonia.)

The term in its ordinary medical use refers to a more *chronic* and passively produced condition of engorgement of the blood-vessels of the lungs. Thus it is constantly present in all severe cases of heart disease, especially disease of the mitral valve, and it is practically always associated with *œdema of the lungs*, or dropsical effusion of fluid from the blood-vessels into the lung substance. The chief symptoms are breathlessness, cough, and abundant frothy, watery sputum, sometimes tinged with blood. Another form of congestion is that known as *hypostatic congestion*, which is due to weakness of the circulation plus the action of gravity. In this it is the back portions of the lungs which suffer, these being the most dependent parts in a patient confined in bed. This may come on after any long-continued severe illness, or after a bad operation, or in old people confined to bed for any reason, such as a fracture in the bones of the leg. Inflammation, or hypostatic pneumonia, may come on in the congested parts, and may easily be fatal in old people. Œdema of the lungs without any congestion may come on in Bright's disease. The symptoms of hypostatic congestion, or of œdema alone, are practically the same as those of the passive form of congestion met with in heart disease.

Treatment.—The condition should, as far as possible, be prevented by not allowing patients, especially feeble or old people, to lie too long on the flat of their backs, but to have them propped up in bed at least part of the time. In old people, considerations as to the proper treatment of, say, such a fracture as that of the neck of the thigh bone, which is common in old people, and which should be treated with them lying on their backs for a number of weeks, have often to go to the wall in view of the great risk of hypostatic pneumonia. If symptoms of congestion do come on, then the circulation must be stimulated by such a remedy as 10 or 20 drops of sal volatile in a little water every hour or two, and by the application of mustard-leaves or of dry cupping over the bases of the lungs at the back. In heart cases regular heart tonics may be used also, and the old-fashioned treatment of bleeding is still very applicable to such a condition as this, the patient being bled from a vein in the arm to the amount of a pint or even more of blood.

Dust Diseases of the Lungs.—Certain trades give rise to diseases of the lungs from the inhalation of particularly irritating dust particles formed in connection with the person's work. The commonest of these trade diseases are coal-miner's lung (anthracosis), stone-miner's lung (chalicosis), and steel-grinder's lung (siderosis). The dust particles set up a form of bronchitis, and ulceration of the bronchial tubes may follow. The sharp particles of steel-dust are the worst, since they readily cause ulceration; coal-dust is much less dangerous, many coal-miners, indeed, never suffering any symptoms from the inhalation; stone-dust is worst when masons work inside covered sheds, and certain stones, such as sandstone, are much worse than others, such as granite, for instance. In some mines—*e.g.* those of the Rand—a condition analogous to stone-mason's lung gives rise to considerable trouble. The worst danger in all these conditions is the secondary invasion, through the ulcerated surfaces, of tubercle bacilli, and the setting up of consumption in the lungs. Previous to such an event the symptoms are cough and gradual loss of health; small hæmorrhages are not infrequent, and breathlessness may come on to some extent. The treatment is largely preventive, and, in most factories and trades where the dust may be dangerous, there are now measures taken to diminish the amount escaping into the atmosphere, and the workers may also have to wear inhalers to catch and strain off the dust. Where symptoms have actually come on, the patient will be well advised if he can change his occupation. The further treatment is that for chronic bronchitis, and, if necessary, for consumption.

Emphysema.—A condition of the lungs in which there is distension of the air-vesicles of the lung, with atrophy of their walls and obliteration of the capillary blood-vessels in them. It is apt to come on in any condition where there is frequent rise of pressure within the lungs. Thus it constantly occurs to a greater or less extent in chronic bronchitis; after whooping-cough, even in young persons; and in certain trades, such as glass-blowing, or in persons who blow wind-instruments. It leads of itself to breathlessness, more or less, depending on the amount present, and it throws a continuous and fairly heavy strain upon the right side of the heart. The appearance of the chest in well-marked emphysema is very distinctive. It is of a sort of barrel shape, the diameter from front to back being much increased, the breast-bone more convex forwards than normal, and the shoulders rounded and hunched up. The chest is, in fact, kept in a position of almost constant full inspiration, and there is very little expansion on breathing, merely a slight lifting up of the chest. The condition is a very chronic one, and, unfortunately, little can be done for it. Any bronchitis which sets up coughing and makes the condition worse must be avoided as far as can be. This means, in a climate such as ours, that the patient must live indoors in a warm temperature most of the winter and spring months if bronchitis is to be warded off, and he will never be fit for any work involving much exertion. Patients who can go to some warm, equable climate will certainly suffer less, but high altitudes must always be avoided.

Gangrene.—The development of gangrene of the lung, which is, fortunately, not a very common condition, depends upon the entrance of certain putrefactive germs into a portion of the lung whose vitality is already lowered. This lowering of vitality may be due to such causes as the inhalation of food, blood, or infective material from the nose or mouth; previous lung disease, such as bronchiectasis, pneumonia, &c.; or spread from surrounding organs, such as the gullet or stomach. The presence of gangrene soon becomes apparent enough from the appalling odour of the breath and of the sputum, which is of a greenish-brown colour. The condition is almost always fatal from exhaustion and absorption of poisonous material from the gangrenous area. Attempts are made to stop the process by inhalation and injection of antiseptics, and the patient's strength must be kept up with strong soups and stimulants, but all treatment is usually in vain.

Inflammation of the Lung.—As commonly used this term is equivalent to pneumonia, or rather to that form of pneumonia which is more properly called lobar pneumonia, because a whole lobe—or, at all events, a large portion of a lung—is equally affected by the disease. If the term pneumonia is used without any qualification, it is that form which is usually meant. (See PNEUMONIA.) There is, however, another form of pneumonia, or inflammation of the lungs, which we must describe here—viz. *broncho-pneumonia*, or *lobular pneumonia*, so called because it spreads by and from the bronchi, affecting a number of small portions or lobules of the lung, or, more commonly, of both lungs. It is also called *catarrhal pneumonia*, because it is an extension into the lung of a catarrh of the bronchial tubes. Children and old people are mostly affected by this form of pneumonia. The majority of cases are secondary to a bronchitis which has spread down into the smallest tubes, being especially liable to occur after attacks of measles, whooping-cough, and influenza, and in young children it accounts for almost all the fatal cases of these diseases. Another form of broncho-pneumonia is due to the inspiration of food, of blood, or of septic material from the mouth, nose, &c. This is liable to happen with patients in an insensible or comatose condition, or with paralysis of any of the muscles concerned with respiration. The symptoms of the first type are those of severe bronchitis plus collapse of the lung. The temperature may reach 105° F. or over, the pulse 150 or more per minute, and the respirations may be as rapid as 70 or 80 per minute. The breathing has a peculiar grunting character, and all the respiratory muscles can be seen working vigorously to try and keep the lungs filled with air—*e.g.* the side of the nose will be noticed to be working in and out, just as in a person who has been running violently; but as there may be so much collapsed lung, it cannot expand properly as the chest expands, and the spaces between the lower ribs can be seen to be sucked in during inspiration instead of coming out. The colour becomes livid, and the expression of the face worn and anxious. The cough, which is paroxysmal and exhausting, may become less and less noticeable; this is a bad sign, unless there is at the same time an improvement in the patient's general condition. In children one is always glad so long as they can cry lustily, but, when this gives way to mere moaning, it is not so good an outlook, as it indicates exhaustion. The attack may last a week or two, and recovery is by lysis—*i.e.* gradually—there being no sudden crisis with rapid betterment after it, as in lobar pneumonia. In the inhalation broncho-pneumonias due to the inspiration of food or other material the symptoms are not so acute, the breathlessness is never so striking, and the patient may simply gradually sink with but merely a little cough, fever, and shortness of breath. The lungs have to be carefully examined to detect its presence.

The treatment is on exactly the same lines as that of a severe attack of bronchitis, but, as it must be energetic, we may recapitulate the main points here. Firstly, do not have the patient, especially if it be a child, in a hot, dry, stuffy atmosphere, or even on the knee in front of a roaring fire and wrapped up tight in no end of blankets "to keep it from catching more cold." This is only too commonly done, but with disastrous results. The condition is due to germs in the lungs, and the patient needs all the air he can get, although he need not be in a howling draught. The ideal condition is a room with a wide-open window and a good fire, a light screen round the bed, into which is playing steam from the nozzle of a bronchitis kettle, keeping the air moist, and very light covering in the way of bedclothes. The diet must be of the simplest—a little milk, beef-tea, or egg-flip every two hours, and a few drops of whisky or brandy may often be added to it with advantage. The position of the patient in bed should be altered from time to time, so as not to allow material to collect in the parts of the lungs which are lowermost, and, in the case of children, lifting them out of bed occasionally and carrying them for a few minutes is advisable. Coughing, so as to clear the tubes, must be encouraged, and a few drops of aromatic spirit of ammonia may be given with a little water every hour, and in bad cases ipecacuanha wine by the teaspoonful, to cause vomiting. Strychnine is frequently ordered by the doctor to stimulate the respiratory powers, and the chest may be well rubbed with camphorated oil. One of the most important points is cold sponging to keep the temperature down whenever it reaches 103° F. It is difficult to get people to realise that this can be done not merely with safety, but with great advantage to the patient, so obsessed are they still with the fear of cold. It cannot be too strongly impressed that a patient who is so feverish cannot get further "colded," and they have only once got to see the striking benefit which follows almost immediately on cold sponging to realise the importance of it. A quiet, restful sleep, instead of restless tossing about and half-unconscious moaning, is not the least important amongst the results following cold sponging. A careful watch should therefore be kept on the temperature, and sponging resorted to whenever it shows a tendency to rise. Oxygen inhalations from a cylinder of oxygen, if it can be obtained, are sometimes of service.

Œdema of the Lungs.—See *Congestion of the Lungs.*

Tumours in the Lung.—The lung may be the primary seat of growths, although but rarely; it is more often invaded secondarily by spread of tumour from some other part of the body. If the growth is at all extensive, there will be more or less interference with the breathing, but a definite diagnosis is only possible by careful and thorough examination, and, unfortunately, nothing can be done to remove tumours in this situation.

Lupus.—At least two perfectly distinct diseases of the skin are described under the term "lupus," so that some qualifying description is necessary. One form, *lupus vulgaris*—that usually meant when "lupus" alone is the term used—is now known to be simply tuberculosis of the skin. In its most typical form this appears first as small yellowish-brown areas in the skin, sometimes described as "apple-jelly" nodules. The face is the most common part for lupus to commence, although it is very often present in the mucous membrane of the nose before it shows on the skin. A catarrhal condition of the skin over these nodules is often present, concealing them with dirty crusts from under which pus exudes; but, by pressing a piece of glass on the skin so as to drive out the blood from the congested capillaries, the typical nodules can be made out in some part or other of the affected area. If left untreated, the disease slowly but surely spreads, and gradually eats away the skin and underlying tissues, and may lead to horrible deformity by destruction of the nose and other parts of the face. Other parts of the body are much less commonly affected. Patients with lupus may develop consumption of the lungs or tuberculosis of other organs, but very often they live for years with no other part affected but the skin. Fortunately such extensive spread can now be checked by suitable treatment. A number of methods are employed, according to the extent and stage of the disease, but in the case of all of them it takes a long time, and must be persevered with patiently until complete cure is obtained, or the whole thing may soon have to be gone through again. Excision, or destruction of the diseased area with strong antiseptics or caustics, was the older plan of treatment, but is now seldom adopted. Treatment by some form of light, either X-rays or the Finsen light, is the method now usually adopted. The patient may also be immunised by the use of injections of tuberculin in very small doses. Such measures are naturally beyond the scope of home or self-treatment, but what is within the power of the patient or the friends to manage, and is very important, is the general health of the individual. As in other tubercular affections, the patient should have abundance of fresh air day and night, and have as much good feeding as circumstances will allow, including plenty of milk. Cod-liver oil, which may be regarded both as a food and as a medicine for tuberculosis, should certainly be taken regularly in some form or other.

The other form of lupus is that known as *lupus erythematosus*, or "butterfly lupus," so called because it most commonly affects an area something like a butterfly in shape—viz. the bridge of the nose, the cheeks, and the ears. This area may show either rounded, raised, red patches, or a grey, scaly condition, or a mixture of these two types. The patches may get well spontaneously, or they may persist, in spite of treatment, for years. Where they clear up they leave slight, superficial, white scars. The cause of the condition is not known, and we would not recommend the patient to try any treatment on his own account, but rather to consult a skin specialist, because it is very much easier to do harm than good. In particular it may be mentioned that all greasy applications, which includes practically all ointments, make the condition worse.

Lymphatic Glands, Affections of.—See under GLANDS.

Lymphatics, Affections of the.—*Acute inflamma-*

tion in the lymphatic vessels produces, a state of affairs which differs very little in its appearance and treatment from cellulitis or erysipelas. (See ERYSIPELAS.) *Chronic inflammation*, or obstruction of the lymphatics, produces a swollen condition akin to elephantiasis. (See ELEPHANTIASIS.)

Lymphatism, Lymphatic Constitution, or Status Lymphaticus.—These various names are applied to a condition which is characterised by an overgrowth of the lymphoid tissue, which is normally present in such positions as the tonsils, the walls of the stomach and bowels, the spleen, and above all in the thymus gland, a structure which lies behind the upper part of the breast-bone. The cause of the condition is quite unknown. The subjects of it are infants, children, or young adults; they often look robust and in excellent health, although perhaps overfat, and soft or flabby. The importance of the condition lies in the fact that persons with it are apt to die suddenly from little or no obvious reason. In infants and children the cause of death is possibly connected with the greatly enlarged thymus gland pressing on the heart, the windpipe, and the large blood-vessels at the root of the neck. Persons with the condition stand chloroform or other anæsthetic very badly, and a number of deaths have occurred under anæsthetics, where, apparently, the only cause of death was the presence of this condition. We have, unfortunately, no way of being sure of its presence, and it may be quite unsuspected; nor, even if it be suspected, do we know of anything which is curative; but obviously no anæsthetic would be administered if there is any reason to believe it present.

Madura Foot, or Fungus Foot of India.—A disease met with chiefly in India, in which nodules appear on the foot, generally on the sole. They are at first hard lumps, but in course of time they soften, break down, and discharge an oily, stinking pus containing black or yellow granules. The discharging sore does not heal up, and other nodules gradually develop and go through the same course, until the whole foot may be involved. The disease is due to a fungus, and is closely allied to actinomycosis (*q.v.*). The only suitable treatment is to have the whole sore cut completely away, which may mean amputation of the foot if it has been allowed to go on long.

Malaria.—Also known by the names of ague, marsh fever, jungle fever, &c. This disease was at one time thought to be due to some evil agent or miasma in the air of marshy or swampy neighbourhoods; it is now known to be always and only caused by the entrance into, and development in, the blood of a minute parasite—this blood parasite gaining entrance through the bite of certain species of mosquitoes. Attacks of fever with cold, hot, and sweating stages are the commonest evidence of malarial infection; but in some severer forms there may be almost constant fever, and it may also run a chronic course, with great weakness and anæmia.

Malaria is widely spread over the world, in tropical and also in temperate regions. Italy, Greece, many parts of Africa, India, and the East Indies, the West Indies, the Southern United States, and Central and parts of South America, may be mentioned as the most affected regions. Apparently only one genus of mosquito is capable of harbouring the malarial organism and conveying it to man, the genus known as the *Anopheles*. This is by no means the commonest form of mosquito, and it can be distinguished from the others by the fact that, when at rest upon a plane surface, its body is held at a considerable angle to that surface, whereas the other mosquitoes keep theirs parallel to the plane. These mosquitoes breed in any stagnant or semi-stagnant water, and such places are therefore indirect factors in the spread of malaria. Another necessity is some already infected person from which the anopheles can get the parasite, for its bite alone is not sufficient; it must first have bitten some person whose blood contains the malarial organism.

The prevention of malaria consists in the following measures: (*a*) Draining or filling up of swamps and marshes. This has eradicated malarial fever from certain parts—*e.g.* the Fen districts of England, where it was once prevalent. (*b*) The covering up of all water-butts, and prevention of small casual collections of water in pools, tin-cans, and the like, or the destruction of the mosquito larvæ in such situations by pouring kerosene over the surface of the water. Regular "mosquito brigades" have been organised for such work in certain tropical towns, and by their means hotbeds of malaria have been converted almost into health-resorts. (*c*) Protection from the bites of anopheles by the use of mosquito curtains or gauze window-screens, particularly at night. (*d*) By isolation of patients who have the parasites in their blood. This is only practicable on a small scale in private houses and barracks. In many malarial districts the majority of the inhabitants may be reservoirs of the parasites without showing any malarial symptoms, having through many generations become more or less immune to the disease. (*e*) By taking daily before entering, and while in, any malarial district small doses of quinine; this will often prevent infection. Five grains of the sulphate of quinine is a sufficient dose for this purpose; it should be taken either as a loose powder, done up in a cachet or twist of rice-paper, or dissolved in water containing a few drops of dilute sulphuric acid—not as tablets, which are very apt to become hard and pass through the body unaltered, never being dissolved at all.

There are several types of malarial parasites, which give rise to corresponding types of malarial fever. The commonest is that which goes by the name of "intermittent fever." This is characterised by the occurrence of attacks of fever at certain definite intervals. But mere intermittence in temperature is not in itself proof of its malarial nature; it may occur in other fevers—*e.g.* kala-azar, or tropical abscess of the liver. The attacks may be daily, every other day, or every third day. Each attack goes through certain definite stages. It commences with headache and a feeling of general wretchedness; then, after some time, comes the feeling of cold or chill, in which the patient's teeth may be chattering, his face pinched, and his skin cold, but the temperature internally is actually considerably raised. There may be sickness, or even vomiting. After some minutes or perhaps an hour the hot stage comes on, in which the skin is hot and flushed, the pulse bounding instead of being small and wiry as before, but the headache persists, and there may be some delirium. This stage may last an hour or so, then comes to a sudden termination by the onset of profuse dripping perspiration. The headache and wretchedness disappear, and the patient often falls asleep, somewhat exhausted, but otherwise well. Between attacks, apart from some weakness, the patient may feel perfectly fit. No rule can be laid down as to how long these attacks will go on. Some cases will get better even without treatment, but, generally speaking, it may be said that the tendency is, even in treated cases, for recurrences to take place, it may be, for years afterwards, if the system is lowered in any way; but, if treatment is carried out skilfully, complete recovery—*i.e.* complete destruction of all parasites in the blood—can be brought about. It is generally advisable to have the diagnosis confirmed by a microscopic examination of the blood, because all cases may not follow such a typical course, particularly if it be not the first attack, and because there is always a tendency in malarial countries to put down all feverish attacks to this disease, whereas the patient may really be suffering from something quite different, such as tuberculosis, typhoid fever, blood-poisoning, &c. The specific treatment for this form of malaria is quinine, a drug which has the power of preventing the development of the malarial parasites in the blood, and so cutting short attacks, and also, if given properly, in most cases, of killing them out altogether. Quinine should not be given during the attack; it merely aggravates the headache and feeling of wretchedness, and does little good then. It should be given either when the sweating stage has commenced, or several hours before an attack is due. In order for the quinine to work properly it must be thoroughly absorbed, and it is therefore practically always advisable to have the stomach and bowels emptied first, and 5 grains of calomel or blue pill is the best thing to do this. The quinine may then be given in powder or solution, as mentioned above under preventive treatment. Ten grains had probably better be taken for the first dose, then 5 grains may be taken thrice daily before meals for several days. Once a person has had a malarial attack, it is advisable for him to take these 15 grains every tenth day or so for six months, and, after that time, every six months to take 5 grains daily for a month, for three years. By this plan he will be pretty certain to prevent any recurrence.

A severer form of malaria is that known as "remittent fever," which may be encountered, especially in the spring and autumn months, chiefly in Greece and Italy, in Africa, and in the Southern United States. In this form the fever is constantly present, although there are times, usually also periodic in their occurrence, when the fever abates or remits. There is usually severe bilious vomiting, and the separation into cold, hot, and sweating stages is not nearly so definite. In a moderately severe attack of this form the symptoms simply gradually abate after perhaps some days or weeks. In bad attacks, which may even be fatal, the patient may either become acutely delirious, and die within a few hours with convulsions and a very high temperature, or he may sink into a comatose condition, with low muttering delirium and picking at the bedclothes, and die of sheer debility.

Another complication of this type of malaria, seen especially in West Africa, although not confined to there, is blackwater fever, or the presence of blood and blood pigment in the urine, and perhaps also bleeding from other parts. (See Black-water Fever.)

Patients who have suffered from many attacks of malaria are liable to become cachectic—*i.e.* they become profoundly anæmic from destruction of blood by the organisms, with emaciation, brownish coloration of the skin, breathlessness, swelling of the legs, and enormous enlargement of the spleen, which may give rise to a definite prominence under the ribs on the left side, and attacks of pain there. This enlarged spleen is, in addition, very easily ruptured by any blow over it, and may lead to death from hæmorrhage.

The treatment of remittent malaria is a much more difficult business to tackle, and the organism is also more resistant towards quinine. It may be impossible to give quinine by the mouth, owing to the excessive vomiting, and it is then necessary to have it administered either by the rectum, after emptying the bowel with an enema, or given by intravenous injection, which is probably the quickest and most certain method of getting the patient under the influence of the drug. The distressing vomiting may be checked by the application of a mustard-leaf over the pit of the stomach, or on the left side of the neck, or in both situations. Even where quinine is not to be given by the rectum it is advisable to have the bowels emptied, and as there is often great torpor of the liver and bowels, very large doses of calomel, even 20 or 30 grains, are sometimes given. Naturally a doctor should be sent for in any severe attack of malaria. After attacks are over, and in the more chronic or in the cachectic stages, arsenic is a drug which is often of the utmost value.

Malformations.—See Deformities.

Malignant Pustule.—See Anthrax.

Malta Fever.—A fever once very prevalent in Malta, but no longer so common there—so little so, in fact, that the islanders have protested against the name. It is, however, fairly common around the Mediterranean Sea, and sometimes goes by the name of "Mediterranean fever," while at Gibraltar it is known as "Rock fever," and in Italy as "Neapolitan fever." It is probably really much more widely spread, and is now known with certainty to occur at least in India, China, and the Philippines. It is a fever with few characteristics, running a long, tedious course, with partial recoveries and relapses, fever and profuse sweating leading to exhaustion, neuralgic pains in the limbs, and swelling in the joints. It is due to a specific germ, the *Micrococcus melitensis*, and in many instances this seems to gain entrance into the body through goat's milk. At all events the disease has been practically stamped out in the British garrison in Malta, which used to suffer greatly, by stopping all supplies of goat's milk, unless first boiled. It may possibly be spread in other ways, although none are known with certainty, but it does not appear to be a disease which is contagious from person to person. It seems to be most prevalent during the summer months, and persons of any age may be affected, but one attack usually gives immunity against any more. The symptoms come on very insidiously, with lassitude, loss of appetite, headache, insomnia, and slight rise of temperature, especially in the evening. This gradually gets worse, the temperature getting higher and higher, till it may reach 104° F. or 105° F. in the evenings, and neuralgic pains and swellings of the joints come on. Every few days or weeks there are remissions in the symptoms, along with profuse sweating and fall in temperature; then the symptoms return, and so the condition may go on, in this undulant fashion, for months. It may be a very weary, long-drawn-out illness, leading to great exhaustion and emaciation, but is not often fatal, although death sometimes occurs from heart failure or some complication in the lungs. It is often difficult to come to a definite diagnosis of the disease for some time, and only by the exclusion of other possibilities, such as typhoid, malaria, and rheumatic fever; although a method, which involves drawing a little of the patient's blood and testing the behaviour of a culture of the specific germ when bathed in this, is now employed, and gives considerable help.

Treatment.—There is, unfortunately, no special measure known which will cut short the attack. The purely liquid diet usually given to fever cases is now being rather given up in this disease, the tendency being to allow any patient whose temperature is not higher than 103° F. eggs, bread, and rice, as well as two or three pints of milk a day, and, if this is well borne, even fish and meat. A purely liquid diet is reserved for cases with higher temperatures. Cold sponging may be employed in all cases, but especially where the temperature is high, and any swollen joints may be kept constantly wrapped in wet cloths. Sleeping-draughts may be required, but, under such a "hydropathic" régime, they are not so likely to be necessary. Whenever the patient is able to travel, change to a cooler climate is advisable, and, to fatten up, rubbing in of oils or cocoa-butter through the skin may be started early in convalescence. Some iron tonic, such as Blaud's pills (one or two thrice daily after meals), is also advisable in convalescence for the anæmia which is produced.

Mania.—See under Insanity.

Marsh Fever.—See Malaria.

Mastoid Abscess, and other affections of the mastoid, or process of bone behind the ear.—See under Ear, Diseases of the.

Measles.—A contagious fever, characterised by a catarrhal condition of the eyes, nose, and respiratory tract, and the development of a dusky-red, blotchy rash over the greater part of the body. The disease is now world-wide in its distribution, and commonly spreads in epidemics, although it is seldom long absent from large towns. The spring and autumn are the times of the year when it is most prevalent. The disease most commonly attacks children, few of whom, indeed, escape it; adults are only rarely attacked. One attack usually confers immunity, although second attacks are not unknown. Although such a common disease, the immediate cause of it has not yet been ascertained, but it must almost of a certainty be some living germ. The infection, whatever it may be, is spread almost entirely by direct contact—*i.e.* a child with the disease, especially in the early stage, when there is cold in the head, but before the rash comes out, by coughing and sneezing spreads the infective agent in the air around, and inhalation gives the disease to others. Schools, children's parties, and the like may therefore spread measles like wildfire. Very short exposure to infected air is sufficient for infection, and the infectivity seems to be greatest in the early stage, before the rash comes, and before measles is definitely recognisable; hence the ease with which it is spread. It is only very rarely spread indirectly by clothes, &c., because the contagion seems to be rapidly destroyed once it is outside the human body.

Symptoms.—For about ten days after exposure to infection there are no symptoms; then the child begins to be feverish, and has all the features of a cold in the head, with running nose, watery congested eyes, and more or less bronchitis and cough. Occasionally there is bleeding from the nose, and both now and later there is photophobia, or sensitiveness to light, from the inflammation in the eyes. About the third or fourth day the typical rash appears, showing up first about the roots of the hair on the forehead, or at the back of the ears, as dusky-red, slightly-raised spots. In the course of one or two days this spreads over more or less the whole of the body, and the face has then a swollen, blotchy appearance, and the whole skin is mottled with the dusky-red spots. Pink spots with a bluish centre can generally be seen on the inner surface of the cheeks, and these are often of value in the diagnosis of measles in slight or doubtful cases, because they are seldom absent, and are not found in other eruptive fevers. The entire duration of the rash is generally about five days, and as it fades the temperature falls rapidly, and convalescence begins with a slight peeling off of fine, bran-like scales from the skin. There is always some bronchitis present in measles, and sometimes it may be very severe, extending down into the lungs as broncho-pneumonia; and this is *the* complication most to be feared, especially in young children. Inflammation of the middle ear, with running from the ear, is another not uncommon complication, while still other conditions may follow, but so rarely as not to need special mention here. In strong and otherwise healthy children there is little to be feared from measles, but in weakly, delicate children, in very young children, or in poor surroundings with careless or incompetent nursing, it may easily lead to fatal results, generally from broncho-pneumonia.

Treatment.—In ordinary cases medication is not required, only proper nursing and attention. The child should be isolated in a room which is darkened to relieve the eyes. The room should be warm (about 70° F. to 75° F.), but not too hot, dry, or stuffy, and a bronchitis kettle pouring steam into the air to keep it moist is always an advantage, and, if there is severe bronchitis, a necessity. The bed-clothes should be light; heavy blankets, causing unnecessary perspiration, should be tabooed. The diet, so long as there is fever—*i.e.* until the rash is fading—should be liquid, consisting chiefly of milk, broths, light custards, and beef-tea. At the commencement a warm bath may be given, and, although it is not often necessary to go in for cold sponging to bring down the temperature, sponging with tepid water twice daily at least, throughout the feverish period, will do much to increase the little patient's comfort. When convalescence begins, there should be a daily bath, and the scalp especially should be well shampooed, so as to get rid of all scales of skin. Isolation should last altogether three weeks. During convalescence, and for some time afterwards, particularly in children who are at all delicate, there must be care taken to guard against chills, as there is often an increased readiness to suffer from catarrh of any of the mucous membranes. Tonics, such as cod-liver oil or syrup of hypophosphites, are often advisable after measles. For the treatment of the severer respiratory complications see BRONCHITIS and *Inflammation of the Lungs*, under LUNG DISEASES, but a doctor should certainly be called in then if this has not been done before.

The fever which measles is most likely to be confused with is German measles, quite a distinct disease. For the different characters of the rash, &c., see under that heading. A rash like that of measles may come on in some people after eating shellfish, after taking phenacetin or such-like drugs, also after vaccination or after the administration of anti-diphtheritic serum, but in all of these conditions the rash is generally short-lived, there is not the cold in the head, &c., and generally no fever.

Mediterranean Fever.—See MALTA FEVER.

Megrim.—See MIGRAINE.

Meibomian Cyst.—A cyst in the glands of the eyelid. (See under EYE, DISEASES OF THE.)

Melæna means a condition in which the stools are dark, tarry-looking in appearance. The condition is due to hæmorrhage into the bowel high up or in the stomach, very often coming from an ulcer of the stomach or intestine. It always indicates rather severe hæmorrhage, and medical advice should be sought. Mistakes are sometimes made by thinking that the black colour of the stools seen in persons who are taking iron or bismuth medicinally is due to altered blood.

Melancholia.—See under INSANITY.

Membranous Croup.—An old name for diphtheria.

Menière's Disease is the name given to a condition in which there are sudden attacks of giddiness, deafness, and ringing in the ears. (See under EAR, DISEASES OF THE—*Ringing in the Ears.*)

Meningitis means inflammation of the meninges or coverings of the brain or of the spinal cord, or, more usually, of both. It is what is generally meant when the term " brain fever " is used. There are several types of meningitis, but, generally speaking, it is an acute disease, and often a very serious or even fatal one. The outstanding symptoms are high fever, headache, severe pain in the back, rigidity and stiffness at the back of the neck, with, frequently, development of convulsions, paralysis, unconsciousness, and coma, ending in death.

We may describe firstly the form known as *epidemic cerebro-spinal meningitis*, also called "cerebro-spinal fever," "spotted fever," and, in Germany, from the rigidity at the back of the neck, *genickstarre* or *genickkrampf*. This disease usually occurs in epidemic form, and may be very widespread, but isolated sporadic cases also occur. It is essentially a disease of temperate, not of warm, climates, but in the temperate zone it may occur at any season. All ages suffer, but children much more than adults. The cause of the disease is a specific germ, the *meningococcus*, but how this gains access to the meninges is not certain, although there is a certain amount of evidence to show that it makes its entry through the nose. How the disease is spread is also a mystery; it does not appear to be particularly contagious from one person to another, and healthy people in healthy localities may be attacked seemingly just as readily as those of poor physique, or of feeble health, or living in unhygienic surroundings. The onset is usually sudden, with a feeling of chill, possibly rigors or shivering fits, and headache, especially at the back of the head, which rapidly becomes more and more severe. It is then followed by pain down the back and backs of the thighs, and the muscles of the back and neck become very stiff and rigid, frequently contracting, so that the head is bored backwards into the pillow and the back bent hollow. The temperature is raised, but not usually to more than 102° F. The patient also complains of sensitiveness to light in many cases. Delirium may come on quickly, but passes ultimately into coma. There is often twitching of muscles, squinting, and other forms of paralysis. In a certain proportion of cases, but varying greatly in number in different epidemics, there appears, about the second or third day, a rash in the form of spots about the body; hence the name spotted fever. These are really areas of hæmorrhage into the skin. Up till a few years ago—prior to the introduction of serum treatment —the mortality from the disease was as high as about 70 per cent., half of the cases dying within five days, the others living longer, perhaps even months, but becoming more and more paralysed and comatose. In some instances the infection is so virulent that death may occur in less than twelve hours, the patient simply being seized with a chill, developing intense headache, becoming unconscious, and dying. Others are more chronic from the very outset. Even in those cases which recovered in the old days there was always a liability not to have complete recovery, but one with blindness, deafness, paralysis or hydrocephalus, and mental impairment. As it is of great importance to have the diagnosis made early and serum treatment commenced, the diagnosis is now usually clinched by the performance of lumbar puncture—*i.e.* a hollow needle is inserted between two of the lower vertebræ into the spinal meninges. If meningitis is present, turbid fluid or pus will be drawn off, containing the specific germs of the disease. Another important sign of the presence of meningitis, and one which anybody can test for, is this: bend one thigh up till it is about at right angles to the body, then attempt to straighten out the leg in line with the thigh. In health this can be done quite easily, but with meningitis the muscles at the back of the thigh (the hamstrings) go into spasm and keep the knee bent.

Treatment.—With the introduction of antimeningococcic serum treatment the mortality from the disease has fallen to 30 per cent., and the horrible after-results of the disease have been greatly lessened in severity. This serum is prepared from the blood of animals which have been gradually immunised against the disease by injection with living organisms in gradually increasing amounts. The earlier the condition is recognised and this treatment commenced the better is the outlook. If this form of treatment cannot be obtained, then very little can be done. The patient should be kept in a darkened room, and some drug will have to be employed to relieve the pain and secure rest. For an adult, 60 grains of bromide of potash dissolved in half a tumblerful of water, 20 grains of chloral in water, or morphia (up to half a grain), or 30 drops of laudanum may be employed; for a child, of course, considerably less, according to age. Ice applied to the back of the neck is useful in relieving the headache, and it is generally advisable to keep the bowels freely opened by the administration of calomel.

Acute Meningitis, not of the Epidemic Form.—Almost any disease-germ may at times gain access to the meninges, and set up acute meningitis with symptoms not differing essentially from those of epidemic cerebro-spinal meningitis, only the causative germ is different, there is no epidemic, and there is hardly ever the spotted rash which is fairly common in the latter disease. The conditions after which acute meningitis sometimes occurs are as follows. Middle-ear disease (running ears), or abscess in the mastoid process of bone behind the ear, is perhaps the commonest cause, the inflammation spreading through the thin plate of bone forming the roof of the middle ear and the floor of the skull. Inflammations about the nose or some of the cavities opening off it may also be the cause, as may be fractures of the skull or festering wounds of the scalp or head. Meningitis may also follow on such acute infective fevers as erysipelas, more rarely influenza, typhoid, and smallpox, also not uncommonly after pneumonia and in any general blood-poisoning. The outlook is always very serious—recovery, in fact, being very rare. It is again of importance to have lumbar puncture performed to find out the causal organism, and, if any vaccine or serum can be obtained against this (which, unfortunately, is not usually the case), there is a little more hope. Otherwise the general measures available are the same as for the epidemic form of meningitis, but, of course, if there is any definite source of infection, such as acute middle-ear disease, that should also be tackled surgically.

One other form of meningitis demands some special mention—namely, *tubercular meningitis.* This form occurs almost entirely in children and young people, but practically only in those with either hereditary tubercular tendencies or with tubercular disease actually present in some part or other of the body, although this need not necessarily be in an active condition. It is specially liable to come on after an attack of such a fever as measles or whooping-cough, the sleeping tubercular germs being wakened up to activity, so to speak, by the illness, and the child, already in a state of somewhat lowered vitality, falls an easy prey to them. There are generally premonitory symptoms for a week or two of peevishness, and a condition of being out of sorts without anything very definite. Then come the definite symptoms of the stage of irritation, such as headache, which is so intense as to make the child constantly utter a sharp, short cry, which is a very peculiar and characteristic one; feverishness; vomiting; starting in the sleep and twitching of muscles; squints; grinding of the teeth; boring back of the head into the pillow; and retraction or hollowing of the abdomen. This passes on into a stage of paralysis and unconsciousness, but there may be convulsive seizures from time to time. Occasionally a temporary improvement occurs, even with recovery of consciousness, but the disease is almost invariably fatal, running its course in about three weeks from the start of definite symptoms. Recoveries are so rare as to make one think that the diagnosis has been wrong when they occur. No known treatment has any influence upon the course of the disease, but the patient should be kept in a quiet, dark room, and ice should be applied to the head. The pain is so distressing that patients have generally to be kept fully under the influence of morphia, and in such a hopeless condition it seems cruel not to save them at least from suffering when one can do no more.

Menstruation, Disorders of.—1. *Dysmenorrhœa,* or *Painful Menstruation.* Theoretically, a woman ought to be just as fit during her menstrual periods as between them, but, practically, this state of affairs is only found among uncivilised races. One of the effects of civilisation seems to be to make a certain amount of local and general discomfort a constant attendance upon menstruation. The disturbance consists of a certain amount of pain in the lower part of the abdomen, radiating into the back and thighs, and of headache, depression, disinclination to work, and other signs of disturbance of the equilibrium of the nervous system. The degree of local and general disturbance varies in every woman; in some it may almost always be considered excessive, but in all there is a limit of suffering beyond which it must be considered as excessive and abnormal. From the point of view of the sufferer's symptoms there are two main forms of dysmenorrhœa: one class in which the symptoms are the same as those of ordinary menstruation, only rather more severe, generally commencing some time before the appearance of the flow, sometimes greatly relieved when the flow comes, in other cases persisting throughout it. In the other class the type of pain is different, being sharp, cramp-like, and coming on in paroxysms, which last a minute or two and recur at short intervals; these come on just before or with the actual flow.

The causes of painful menstruation are very varied, and the degree of suffering frequently depends on the sensitiveness of the patient's nervous constitution, and not upon anything wrong with menstruation. Such cases cannot be cured. But, apart from this, it is a well-known fact that dysmenorrhœa of a very severe and obstinate character may occur without any discoverable disease of the womb or its surroundings, while, on the other hand, advanced diseases there may be quite free from pain in menstruation. Apart from a general nervousness of constitution, the chief causes are general ill-health, especially anæmia in young women living in poor hygienic surroundings, or in a constant whirl of gaiety, or the victims of "higher education"; any obstruction to the flow, such as may result from displacements of the womb, especially backward displacement, simple tumours or "fibroids" (which may be quite small and present for many years without other trouble); or inflammation of any kind and in any of the internal organs of generation.

Treatment.—As the cause of the undue pain and disturbance attending menstruation can but seldom be made out exactly by the patient herself, the question of having a local examination made is one which requires consideration. If the condition comes on in a married woman, or if it is accompanied by other signs of inflammation, such as more or less persistent pain and constant whitish discharge (see *Whites*), an examination should be made without delay. But in many women, and especially young unmarried women, general measures of treatment should be given a thorough trial first; and it is only when these are found to fail to give relief, or if the case is a very aggravated one, that the propriety of having an internal examination made (preferably under an anæsthetic) is to be advised.

In the first place, the general health and habits of the sufferer will demand attention, and, if these are made satisfactory, many cases recover completely. There must be a sufficiency of sleep, not less than eight hours. Overwork, too little fresh air and exercise, and too many lessons are responsible for setting up dysmenorrhœa in many growing girls, and the condition is naturally aggravated if they go off their food and have too little sleep. Rest is probably the remedy which will give more relief than any single other measure; complete rest in bed during the period is necessary while cure is in progress. The prevention of constipation is another important consideration; the bowels may, in fact, be rather loose during the period with advantage. This is best done by taking some mineral water or some form of salts every morning for a day or so before the flow commences. (See also under CONSTIPATION.) Some remedy directly relieving pain is often necessary. Most of the patent medicines advertised for this object contain large quantities of alcohol, and their employment is not to be recommended. Phenalgin in 5-grain powders may safely be taken every four hours, or 3 to 5 grains of phenacetin along with 20 to 30 drops of sal volatile in a little water. Apiol, a preparation made from a species of parsley, in 1-grain capsules, is also a useful drug, one being taken night and morning for several days before menstruation. A hot mustard foot-bath, or a hot-water bottle over the abdomen, will also be found to serve in some instances. If such general and special measures do not give relief after a thorough trial for several months, then the patient will be well advised to consult a doctor to see whether some more radical measure is not necessary.

2. *Amenorrhœa, or Absence of Menstruation.*—In a few rare cases menstruation never appears, owing to imperfect development of the womb or other internal organs. Such persons may or may not be otherwise perfectly sound and healthy. Such conditions can occasionally be rectified by surgical means, but not always. Much more frequently amenorrhœa is an acquired condition—*i.e.* the menses stop after having been previously present. In this connection it must be remembered that absence of menstruation may be a purely natural and physiological condition, and not the result of disease. The natural causes of the stoppage of the menstrual periods are pregnancy, the onset of the menopause or change of life, and usually lactation or nursing. Of diseases, it may be said that almost any disease, acute or chronic, which makes a severe strain on the individual's strength, causes the periods to cease, and this repression has generally been regarded as a conservative effort on the part of Nature to keep up the patient's strength. Chlorosis, the ordinary anæmia or bloodlessness of young women, is, of all conditions, the commonest leading to cessation or great diminution in the frequency and amount of menstruation, sometimes amounting to complete disappearance. There may also be other causes leading to amenorrhœa, not exactly of the nature of diseases—for example, excitement, shock, or fright of any kind; change of climate; overwork, mental or physical; or exposure to cold before or during a menstrual period. These conditions usually lead to a temporary cessation only, the periods returning when the cause is removed, as, indeed, is usually the case also with amenorrhœa resulting from disease, although in that case the cessation may be permanent if the disease has lasted long.

As a rule there are no special symptoms traceable to the cessation of menstruation, merely those of the disease causing it, but sometimes there is pain, headache, nervousness, and flushing at periods when menstruation might be expected. The treatment also, apart from those few cases due to maldevelopment, is simply that of the underlying disease, plus, in many cases, the regular use of iron in some form or other. (See especially under ANÆMIA—*Chlorosis.*)

3. *Excessive Menstruation, and Bleeding from the Womb.*—In some instances the bleeding is obviously associated with the periodic and regularly recurring menstruation, only the bleeding is excessive in amount for that individual, either lasting too long, coming too freely, or coming at too short intervals. In other cases the hæmorrhage occurs at irregular intervals, and bears no manifest relation to menstruation; whilst in still other cases both conditions are present, as the same cause may often lead to both kinds of hæmorrhage, and it is convenient to consider them together. Persistent excessive loss of blood from the womb from any cause soon leads to anæmia and general debility. The causes may be divided into general and local. Amongst the general causes may be mentioned the onset of menstruation in young girls, when it is often excessive and rather irregular; anæmia, although more often leading to diminution or cessation of the flow, sometimes causes it to be excessive; chronic congestion of the womb, from weakness of the circulation or actual heart disease, is a not infrequent cause; and acute infectious diseases, such as influenza, pneumonia, or scarlet fever, are apt to be followed for some time by excessive menstruation. Locally almost anything wrong with the womb or its connections, of the nature of inflammation, congestion, displacement, or growth, may be responsible for undue hæmorrhage, both at the periods and between them.

In a girl or young woman, growths or tumours can practically be excluded as possible causes. In a woman of about thirty, a slight backward displacement of the womb is a common cause, in which case the trouble will come on fairly quickly; if it comes on more gradually, it is more likely to be a fibroid growth of the womb, or else some inflammation of the lining membrane of the interior of the womb. In women over thirty-five the possibility of cancer must always be kept in mind, and, whenever a woman over this age is troubled with increasing instead of diminishing menstrual flow, or with hæmorrhage at any time, the sooner an examination is made the better, because, if it is cancer, it should be removed at the earliest possible moment. Hæmorrhage in a married woman may be due to a threatened or an incomplete abortion, in which everything has not come away, or to an extra-uterine pregnancy (see under PREGNANCY), and such a possibility requires to be disproved by examination before a definite diagnosis can be come to. In married women it is, of course, frequently also due to inflammations, displacements, or growths.

Treatment.—Much the same rule may be laid down as to the advisability of having an internal examination made as in the case of painful menstruation, but in married women, and especially in elderly women, there should be no delay in having it done. For menstruation which tends to be irregular and excessive, at the time of onset in girls, or when wearing off at the change of life, the best plan is for the patient to rest in bed for a day or two, commencing, if possible, before the flow appears; and a very useful drug at these times is viburnum prunifolium, of which from a half to two teaspoonfuls of the liquid extract may be taken twice daily for a few days at this time. In girls there should always be avoidance of any great exercise just before menstruation. In girls and young women there should never be commenced the practice of regular douching; it seldom does any good, and, if the condition is at all a long-lasting one, only puts off the proper examination which is essential for a correct diagnosis and treatment. There are certain drugs which can control hæmorrhage from the womb to a certain extent, but none which can cure excessive flow with any certainty. There may be mentioned apiol, which for this purpose should be taken between the periods only, in a dose of from three to six drops in capsules three times a day; and styptol, of which the dose is half a grain in powder thrice daily until menstruation commences, when it may be taken every three hours. In older women, when there is no serious disease of the womb, the use of a hot douche is often of service in checking hæmorrhage, and it may even cure the condition altogether. To use it properly the patient must be in bed, lying on her back, with the hips on a bed-pan. From one to two gallons of water, at a temperature of not less than 110° F. and not over 120° F., should be put in the douche-can, raised some two or three feet above the level of the body, and allowed to flow gradually out, the nozzle being inserted as high as possible into the vagina. This should be used night and morning between the menstrual periods, only being employed while the period is on if the flow is very excessive. If such measures do not fairly quickly bring about improvement, then medical advice should be sought.

Mental Deficiency and Disease.—See IDIOCY and INSANITY.

Micturition, Troubles with.—See under BLADDER, DISEASES OF THE; PENIS, AFFECTIONS OF THE; and WOMEN, DISEASES PECULIAR TO.

Middle-ear Disease.—See under EAR, DISEASES OF THE.

Migraine.—Also known as "sick headache" or "bilious headache." A very severe form of headache, commonly limited to one side of the head, and associated with nausea and vomiting, and frequently, but not always, with peculiar disturbances of vision. It is commonest in women, in nervous, highstrung individuals, and in brain-workers. There seems to be a hereditary tendency to it in certain families. The immediate cause of the attack is probably usually some poison manufactured inside the body, and such causes may be sought for as digestive disturbances, mental overwork or worry, also working in hot, stuffy rooms, and perhaps, associated with any of these, undue sexual indulgence. In women it is frequently associated with anæmia and with the menstrual periods. Errors of refraction in the eyes are sometimes to blame, and it is always worth while having the eyes examined if suffering from migraine. Attacks vary considerably in their severity; sometimes the individual feels particularly bright and well just before the onset of one; in other cases he may be out of sorts and depressed for a day or two beforehand. A typical attack of migraine follows something like this course: Arising in the morning quite well, towards evening the patient begins to see a bright spot on one side of the field of vision; this gets larger but more indistinct, and there is an appearance of zigzag lines of light with pain and throbbing in the eyes. These appearances fade as the headache becomes more and more severe, and with it there is often some giddiness, mental dullness, or even a slight loss of speech, or, at all events, inability to find words to express one's ideas. After an hour or so the patient becomes nauseated and then vomits. The vomit is usually small in amount and very acid and burning; if it lasts any time it becomes greenish and bilious in character, but generally the attack soon passes off when vomiting starts. As the attack subsides there is commonly passage of a large amount of clear urine. During attacks the arteries of some sufferers will be found to be greatly tightened up, feeling like bits of whipcord.

Treatment.—It is not always possible to prevent attacks coming on, but the patient should see whether any of the causes of migraine mentioned above are not responsible, and avoid them as far as possible, leading a simple life without over-excitement of any kind. When an attack is threatening it can sometimes be stopped or cut short by taking a cup of strong black coffee or a glass of neat brandy, lying down absolutely quiet in a dark room, applying cold to the head, and taking no food. In a person whose arteries get tightened the administration of some dilator of the vessels is the best treatment. Such an individual should, therefore, get a boxful of tablets containing each $\frac{1}{100}$ of a grain of nitroglycerine, take one when an attack threatens, and repeat in an hour or a couple of hours. Along with the measures mentioned 10 or 15 grains of phenacetin may be taken, or better still, the following prescription:

℞ Ammonium bromide	15 grains
Phenacetin	15 grains
Salicylate of soda	15 grains
Citrate of caffeine	2 grains
Aromatic spirit of ammonia	20 minims
Water	to ½ ounce

Should these measures fail to stop the attack they will at least give some relief, and the unfortunate patient must just possess his soul in what patience he can muster up, and wait for the vomiting and the attack to pass off.

Miliary Fever, or the *Sweating Sickness,* is a disease characterised by fever, profuse sweating, a peculiar feeling of oppression or constriction in the upper part of the abdomen, and about the third day of the illness, a rash of red pimples over the body, and between these little blisters containing clear fluid. The cause of this fever is unknown, and, although still occurring in epidemics occasionally in various parts of the world, it appears to be much less common than it once was. The fever generally lasts about nine or ten days, and may be followed by a relapse. It may cause considerable emaciation, but is rarely attended with any serious consequences. The only treatment necessary beyond that generally applicable to any fever (see FEVER) is cold sponging to control excessive rise of temperature, and copious draughts of water to compensate for that lost by the drenching perspiration. Should there be any serious symptoms, such as delirium or faintness, a medical man should certainly be called in, if one has not been in attendance before.

Milk Fever is the name applied to a slight feverish attack from which mothers sometimes suffer about the third day after childbirth, but it is a condition which does not require any treatment.

Milk Sickness is the name applied to a disease sometimes communicated to man through the milk, or by butter or cheese made from the milk, of cows with "the trembles." The disease seems to be confined to the South-western United States. The affected cows refuse to eat, have a staggering gait, and muscular tremors, whence the name "trembles." In man there is abdominal pain, vomiting, foul tongue and breath, fever, and muscular tremors. In severe cases there may be delirium, convulsions, and even coma and death. There seems to be some doubt whether the condition is not really some form of irritant poisoning. The treatment is purely symptomatic—sedatives, such as bromides or opium, or stimulants, being given as required.

Mind, Disorders of the.—See INSANITY.

Miner's Disease.—See under PARASITES, INTESTINAL—*Ankylostomiasis.*

Miner's Nystagmus.—See NYSTAGMUS; and EYE, DISEASES OF THE.

Miscarriage.—See ABORTION.

Mole.—The term is used in two perfectly distinct connections. One kind of mole refers to a mark on the skin present from birth. For varieties and treatment see BIRTHMARKS. The other form of mole, or molar pregnancy, is the result of a degenerative process going on inside the womb during pregnancy. The child dies, and when delivery takes place (usually an abortion or miscarriage, considerably before full time), what is seen is a mass looking either like a piece of flesh or like a bunch of white grapes, there being the two forms of degeneration.

Molluscum Contagiosum.—See under SKIN DISEASES.

Mongolism.—The name applied to a certain form of imbecility in children in which the eyes are set rather obliquely as in the Mongol races. There are also other peculiarities of structure—flat face, large thick lips, large protruding tongue, &c. Development is slow in these children, and obstinacy is usually a marked feature. They are to be treated on the same lines as other imbeciles. (See IDIOCY.)

Monomania.—See under INSANITY.

Morning Sickness.—In women a common symptom in the early months of pregnancy, and sometimes so severe as to require special treatment. (See PREGNANCY, COMPLICATIONS OF.) In men it is probably a sign of alcoholic habits, of cirrhosis of the liver and consequent chronic congestion and catarrh of the stomach, or of Bright's Disease. (See these conditions.)

Morphinism.—See section of the book dealing with Drug Habits.

Mortification.—See GANGRENE.

Mother's Marks.—See BIRTHMARKS.

Motions, Affections of the.—See STOOLS, ABNORMAL CONDITIONS OF THE.

Mountain Fever.—A name sometimes applied to a fever occurring in mountainous districts, especially of North America. It is now regarded as simply typhoid fever. (See TYPHOID FEVER.)

Mountain Sickness.—The name applied to the symptoms which come on in persons ascending into the rarefied air of great heights, either climbing mountains or going up in a balloon. The symptoms are headache, giddiness, thirst, intense breathlessness, sickness, and sometimes vomiting, bleeding from the nose not uncommonly, great weakness, going on to unconsciousness sometimes. The symptoms are due to the deficiency of oxygen in the rarefied atmosphere and to the low pressure, and they usually pass off rapidly on descending again to lower elevations, leaving no permanent ill effects. There is considerable variation in the severity of the symptoms in different persons, and also in the height at which symptoms begin to come on. Severe exertion, exposure, and insufficiency of food make the symptoms worse, so that they come on at lower heights when climbing than when simply ascending in a balloon. Even the rapid ascent to comparatively low elevations, such as that by rail from the west coast of South America to the Bolivian plateau (about 12,000 feet), causes some breathlessness on any exertion, and sometimes even sickness, but persons living at such elevations become acclimatised to the conditions, their blood developing more red corpuscles or oxygen carriers, and it is found by experience that persons who constantly live at a considerable elevation are the best fitted for taking part in attempts at very high mountain climbs.

Mouth and Tongue, Affections of the.—In the first place examination of the mouth cavity may yield evidence of the presence of general diseases or of disease elsewhere.

Pale-coloured *lips* are often significant of anæmia, and blueness of heart disease.

The *odour of the breath* is sometimes distinctive, as, for example, the sweet odour in advanced cases of diabetes, the earthy narcotic odour of laudanum in opium poisoning, the alcoholic odour of those who have been drinking, the foul breath of those with decayed teeth, or dyspepsia, and the intensely fœtid breath of some lung diseases. (See BREATH, BAD OR FOUL.)

The *gums* show pallor in all anæmias; a blue line at the junction with the teeth, especially those with a deposit of tartar on them, in chronic lead poisoning; they may be spongy, red, and bleeding in persons with scurvy and in bottle-fed infants, in some cases of persons with severe general diseases, from decayed teeth, or from a local inflammation of the mouth cavity. (See GUMS, AFFECTIONS OF THE.)

Local redness and swelling of the gums usually attends the cutting of teeth. *Teething* in otherwise healthy and robust children should not give rise, at most, to more than a little fretfulness and slight fever; in feeble or poorly nourished children it may give rise to acute indigestion with high fever for several days, but there is a common tendency to attribute all sorts of troubles to teething, and other conditions, especially indigestion from improper feeding, should be excluded before this too ready diagnosis is made. *Delayed dentition* is most commonly due to rickets. If the two upper central teeth of a child's second set are peg-like, tapering from the gum to the edge, and with a notched edge, it is very suggestive of congenital syphilis. Loosening or dropping out of the teeth is often associated with sponginess of the gums and any of the conditions causing this. Early, extensive, or rapid decay of the teeth is commonly due to rickets, but occurs also from pregnancy and in diabetes. Much can be done to stop decay of the teeth by proper attention to them, however. (See TEETH, AFFECTIONS OF THE.) Grinding of the teeth in children when asleep is frequently attributed to "worms": it may be due to this cause, but may arise from almost any upset of digestion or of the bowels. It also occurs as a symptom of meningitis, hydrocephalus, and other nervous diseases.

Inability to move the jaw or open the mouth properly may be due to commencing lockjaw or to some paralysis of the muscles moving it (this is rare, and usually affects only one side, so that food can only be masticated on one side of the mouth), or it may simply be caused by the pain and swelling of mumps, tonsilitis, gumboil, &c.

Colour changes.—Yellow discoloration over the lining of the whole of the mouth cavity is early seen in jaundice, whilst brownish discoloration is met with in Addison's disease. The dark red rash of measles is sometimes seen on the roof of the mouth before it appears on the skin, and on the inner surface of the cheeks: small red spots with a bluish white centre are very characteristic of this disease. The bright red blush of scarlet fever all over the inside of the mouth is very typical (see also below for the appearance of the tongue); a slighter redness may indicate local inflammation of the mouth. White spots or patches or ulcers in the mouth are indicative of local disease. (See below.) *Dryness* of the mouth may be present in almost any feverish condition, but it may also come on temporarily from fright. Waking in the morning with a dry, stiff tongue is very characteristic of mouth-breathers, a condition usually due to enlarged tonsils and adenoids. (See ADENOIDS.) Persistent dryness may come on from chronic indigestion or in chronic Bright's disease. *Excessive flow of saliva*, with perhaps dribbling of saliva from the mouth, sometimes occurs in early pregnancy, also in any mouth inflammation or irritation from the teeth. Dribbling without excessive flow occurs in idiots, and where there is facial paralysis.

Mucous patches, slightly raised, red at the edges, and velvety white in the centre, are commonly seen all over the lips, mouth, and throat in the secondary stage of syphilis. They are very infectious. Their treatment is that of syphilis generally. (See under VENEREAL DISEASES.)

Inflammation of the mouth, or *stomatitis*, is a disease met with practically only in infants and children. It may occasionally be due to some irritating substance or too hot fluid taken into the mouth, but, as a rule, it is associated with difficult teething or the use of a dirty rubber teat, although sometimes it is part of a general fever, such as measles. In its simplest form the symptoms are redness inside the mouth, pain, manifested especially, when an infant takes the breast or the bottle, by crying and immediate dropping of what has been taken into the mouth. There is usually excessive flow of saliva and dribbling over the chin. Frequently there is diarrhœa. In a more severe case there may appear spots, which look as if little pieces of the lining of the mouth had been snipped out with scissors, and these are excessively tender. In the severest form, which is usually seen in rather older children, especially those who are feeble or badly nourished, extensive *ulcers* may form. The breath is often very foul, and there is great suffering, interfering with feeding and rapidly undermining the patient's strength. Decayed teeth may cause bad ulcerative stomatitis. In the worst form of all, cancrum oris or noma, the whole cheek may get gangrenous and eaten away. This is, however, very rare; when it does occur, it is usually in weakly children, and often after measles.

Treatment.—In the simpler forms the following mouth-wash, used fairly frequently but not swallowed, will generally put matters right in a day or two:

℞ Potassium chlorate	30 grains
Tincture of myrrh	1 drachm
Elixir of calisaya	to 3 ounces

A tablespoonful diluted with two tablespoonfuls of water to be used at a time.

In very young children this must be swabbed over all the affected parts with some cotton-wool wrapped round something, such as a pencil. The food should be entirely liquid, and given to drink from a cup, if at all possible, so as to avoid the pain of anything solid in the mouth. If there is any suspicion of scurvy, fresh fruit juice and fresh meat juice should be given. The greatest care must be taken subsequently to see that the feeding-bottles and everything entering the mouth are thoroughly cleaned. The ulcerative form is a much more serious condition, and a doctor should certainly be called in; it is usually necessary to have the ulcers touched with some powerful remedy, such as nitrate of silver. For noma the whole gangrenous part must be cut away or destroyed.

Thrush is the name given to a disease in which there are the same feelings of discomfort in the mouth as in inflammation, but in it there appear white pearly specks like milk curd, which grow rapidly and coalesce into a membrane, of which masses can often be pulled off, looking like pieces of somewhat dirty, sodden blotting-paper, and leaving a slightly raw, bleeding surface. This membrane is a fungus growth, and it only appears in children in impaired health, or who have been using dirty feeding-bottles, or in adults who are in a very low state of vitality. Of itself it does not matter much, but it indicates a serious lowering of the system, urgently requiring treatment, if there is none already in progress. The thrush may be removed by washing the mouth frequently with borax solution, 10 grains to the ounce of water.

Inspection of the tongue frequently yields important evidence of a patient's condition, and should be done as a matter of routine in all illness. A thin white fur on the tongue is of no import, as it may be present in perfect health, especially in smokers. A flabby, indented tongue with a uniform brownish fur indicates catarrh of the stomach, usually of some standing, and the need, amongst other things, of a good purge. In bad fevers, especially in typhoid, the tongue becomes fissured down the centre, with fur along the edges of the fissure, while the tip and edges are red; or, if things are getting worse, it may either become very dry and fissured all over, or dry, red, and glazed. In children with catarrh of the stomach there is often a peculiar appearance, like that of a worm-eaten leaf, on the surface of the tongue. A tongue covered with white fur, through which peep a number of red spots, forms the so-called "white strawberry" tongue seen early in scarlet fever, but a somewhat similar appearance may be present in other fevers also. The mucous patches of secondary syphilis on the tongue have already been referred to.

Enlargement of the tongue, the best proof of which is the presence of indentations along the sides from the teeth, occurs from a number of diseases, and advice should be sought if this is noticed.

Atrophy, or shrinking of the tongue, or, more commonly, of one-half of it, may be present in certain diseases of the nervous system, and is often associated with paralysis of one side of the tongue, so that, when it is put out, it goes to one side instead of coming straight.

Tremor of the tongue is most commonly seen in chronic alcoholism, but may indicate a commencing general paralysis of the insane, or some nervous disease.

Fissures on the tongue may be present without any disease, especially in elderly people; sometimes they indicate a proclivity to hot or irritating food or drink. Not infrequently they are syphilitic in their origin.

Ulcers on the tongue are often present when there is ulcerative inflammation of the mouth generally. (See above.) They are sometimes tubercular, but, as a rule, only when there is advanced tubercular disease in some other part of the body. A single ulcer with a hard base and margins in a person over forty should always be looked upon with suspicion, as it may be the first appearance of *cancer*, and, if so, the sooner there is an operation the better. In whooping-cough a little ulcer often forms under the tip of the tongue, where the "tie" is.

The condition known as *leucoplakia*—sometimes, though rather unjustly, as smoker's tongue—consists in the development of shiny white, hard patches on the surface, with some wrinkling. It may be due to smoking, but it also appears in people who do not smoke at all. There are usually no symptoms, but there is a possibility that the condition may later pass on into cancer. Any person with the condition should certainly not smoke, nor take any very hot things to eat or drink. If there is any discomfort, advice should be obtained.

Tongue-tie is said to be present when the little fold running from the under surface of the tip to the floor of the mouth is shorter than normal. If pronounced, it prevents the tip of the tongue from being protruded, makes sucking difficult in babies, and, if allowed to persist, may cause a lisp. A slight nick with a pair of scissors will put matters right, but this must be done carefully, owing to the risk of hæmorrhage.

Salivary Glands.—*Ranula* is the name given to a cyst filled with clear fluid which may form under the tongue from blocking of the opening of one of the ducts from the salivary glands in the floor of the mouth. It may become the size of a walnut, and is uncomfortable. The treatment consists in having a piece of the wall of the cyst cut out.

Inflammation of the Salivary Glands.—The commonest form of this is mumps, an infectious epidemic inflammation of the parotid gland, situated over the angle of the jaw, below and in front of the ear. (See Mumps.) Simple, non-infectious inflammation of this gland also occurs, the treatment and symptoms being practically the same as in mumps, except that there is no need for isolation. This gland may also be the site of tumour growth, both of non-dangerous and of malignant nature. It is difficult to distinguish between the two forms, and, as any such growth is rather disfiguring, it is always advisable to have it removed by operation.

Obstruction to the flow of saliva sometimes occurs from the formation of a little stone or calculus in the duct of the parotid; the saliva still forms when food is taken, and there is painful enlargement in the gland during and after meals. The stone can sometimes be felt as a hard little lump in the cheek. If allowed to remain, it is apt to ulcerate through the cheek, and is better removed early. A simple little opening inside the cheek is usually all that is required.

Movable Kidney.—See under Kidney, Diseases of the.

Mucous Colitis.—See under Intestines, Diseases of the.

Mumps.—An acute infectious disease, characterised mainly by swelling and pain in the parotid gland, situated just below and in front of the lobe of the ear. The disease occurs in regular epidemics, chiefly in children and young people, although adults are by no means exempt from attack. One attack generally gives complete immunity against a second. The infection is usually direct, by coming near some one with the disease; only very rarely, if ever, can the infection be carried by clothes or by a third party. Once started, an epidemic is very difficult to stop by any means such as isolation, because the condition is infectious several days at least before the swelling appears and the individual is known to have it, and the infectivity lasts for not less than three weeks after the onset of symptoms. The time between exposure to infection and the first appearance of the swelling is also long, from two to three weeks. The result is that, once it has got into a household, it is liable to go the round of the members, each one going down with it at intervals of a few weeks. During the incubation stage there may be no symptoms, or there may be some sore throat, headache, and general feeling of discomfort. Then the temperature rises to about 103° F., with aching pains on one side of the face, seldom on both sides to start with, although the swelling may spread, a day or two later, to the other side. The swelling rapidly grows, being very tender and painful on moving the lower jaw, as in the act of eating. The pain may shoot up to the ear and cause ringing noises in it. There is a profuse flow of saliva, a coated tongue, and foul breath. After three or four days the fever and the swelling disappear, and the attack is over, although, as mentioned above, the patient is still infectious for about a fortnight. The only complications which are likely to occur are swelling and inflammation in the testicles in boys; or in the breasts, and occasionally the ovaries, in girls. These are seldom seen except where the patient has been allowed up too soon. Such inflammation of the testicles is very painful, lasts four or five days, and is liable to cause atrophy of the organs, which, if complete, results in sterility.

Treatment.—The patient should be in bed so long as there is any fever or swelling present. If this is done, there is little fear of any complications. The food should be light and liquid, or sloppy, so as to minimise the amount of opening of the mouth and chewing necessary. An aperient should also be given so soon as the person is seen to be turning ill. While the pain and aching are severe, poultices or hot fomentations may be applied over the swelling, or it may be smeared with glycerine and belladonna, and it should be kept covered and warm until the swelling is quite gone. Should any of the complications mentioned above ensue, they are to be treated in exactly the same way as the original mumps. It is often very difficult to enforce isolation for the long period over which mumps is contagious, but any one who has mumps should, at the very least, keep out of the way of children for three weeks from the time the swelling comes on.

Muscæ volitantes, or floating specks seen in front of the eyes.—See under EYES, DISEASES OF THE.

Muscles, Diseases of the.—Although forming such a large part of the body, the muscles are not subject to many diseases.

Acute inflammation of muscles may occur from wounds, &c., with abscess formation, but usually wounds in muscle heal very well. There is no special treatment beyond that generally applicable to inflammation and abscesses.

Chronic inflammation in muscles is a more common affection, and is often spoken of as *muscular rheumatism*, although there is considerable doubt if it is in any way the same disease as rheumatism of joints. *Myalgia*, or pain in the muscles, is a similar condition. The commonest sites of this condition are in the muscles of the back, where it is usually known as lumbago; in the neck muscles, giving rise to one form of stiff-neck; and in the muscles between the ribs, where the condition may be mistaken for pleurisy, but in pleurisy there is not the same tenderness to the touch. Almost any muscle in the body may, however, be affected. The chief symptoms are stiffness, pain on movement, and tenderness to the touch. For the treatment see LUMBAGO; in other situations the measures to be employed are similar. There is one form of chronic inflammation in muscles, affecting those of the back as well as other situations, where bands of fibrous tissue form in the muscle, and can be felt by running the fingers over them. This is best treated by injections of a substance known as fibrolysin, which has the power of softening these bands, but vigorous massage is also necessary to remove the softened fibrous tissue.

In some muscles which are the seat of long-continued irritation, bony formations may occur, as, for instance, in the muscles on the inner side of the thigh in people who spend much time in the saddle—the so-called "rider's bone." No treatment is of much service for this beyond stopping the irritation which is producing the condition.

Cramp is a condition of painful spasm in muscle. (See CRAMP.)

Shakiness or *tremor* may be due to disease in muscle, but is more likely to be due to some nervous affection or more general disease. (See TREMOR.)

Stiffness and soreness in muscles is apt to come on after any severe or unwonted exertion, along with a general sense of fatigue. The best treatment for this is massage after a hot bath, the waste products formed by the long-continued muscular exertion, which give rise to the fatigue and stiffness, being rubbed out of the muscles in this way.

Weakness in muscles, along with fever and other symptoms, is sometimes due to parasites getting into the muscles from the eating of "measly meat." (See *Trichinosis*, under PARASITES.)

Wasting or atrophy of muscles may be due to emaciation coming on from any cause; it may be due to various diseases of the nervous system, and is then usually associated with paralysis, and often with contractures (see under these headings); but there is also a disease, known as *myopathy* or *muscular dystrophy*, in which the muscles themselves are at fault. This is rather a rare condition, whose cause is quite unknown, but it tends to run in certain families, being transmitted particularly by the females, and the symptoms generally appear in childhood or in early life. This disease assumes several forms. In one, the commonest, sometimes known as *pseudo-hypertrophic muscular paralysis*, the child may look like a little Hercules, the calves, buttocks, and muscles about the shoulders looking very large and well developed; but it is only apparent, the increase in size being really due to fat which has taken the place of the muscle, and the child is in reality weak and feeble, especially in attempting to rise from the sitting or lying posture. Later on the affected muscles become small and wasted. Periods of arrest may occur, but ultimately the patient becomes entirely powerless and bedridden, until he falls a victim to some other complaint, perhaps an attack of bronchitis, which to a healthy person would be a mere trifle, but which he has not the strength to withstand. In another form, coming on usually about the age of fifteen, the wasting and weakness affect the arm and back muscles first, later on the legs. With this there is no early seeming enlargement. In still another form, not only are the muscles about the shoulder affected, but also those round the mouth, so that the lower part of the face is expressionless, and saliva tends to dribble. The onset of this form may be delayed till adult life, and it is the least progressive, except the last form, which causes weakness in the muscles of the foot, so that foot-drop results and a kind of club-foot may develop. This form may persist for years without other muscles becoming involved.

Treatment.—Nothing is known which has any influence in stopping the progress of any of these forms of myopathy. The most that can be done is to have the patient living out of doors as much as possible, resting most of the time, never tiring the affected muscles. Gentle massage and electrical measures are sometimes employed. Efforts to remedy any contractures which may form are useless, as the relief will be purely temporary.

Another rare affection is that known as *myasthenia gravis,* in which it is not certain whether the primary fault is in the muscles or in the nervous system; but the main symptom is muscular weakness and rapid fatigue when any effort of muscular exertion is made, making it necessary for the individual to rest for some time before the particular effort can be performed again at all. There is no wasting of the muscles. This disease affects adults. It may cease of its own accord and recovery be complete, or it may cease to progress, or it may gradually become worse, involving the muscles of speech and of swallowing, and death is apt to occur from an inhalation pneumonia due to food getting down into the lungs. There is no treatment which has any direct influence upon the disease, the only thing being for the patient to rest and husband the strength as much as may be.

Mutism.—See Deaf-mutes.

Myasthenia.—See above, under Muscles, Diseases of the.

Myelitis, or Inflammation of the Spinal Cord. —See under Nervous Diseases.

Myopathy.—See under Muscles, Diseases of the.

Myopia, or Short-sight.—See under Eyes, Diseases of the—*Errors of Refraction.*

Myxœdema.—A condition coming on in adults, especially in women, in which there is general swelling in the skin and subcutaneous tissues—giving rise to an appearance something like the dropsy of Bright's disease—a dull, heavy expression and mental torpor, and falling out of the hair. It is due to deficiency in the secretion of the thyroid gland in the neck, from atrophy or disease of that gland. Sometimes it follows upon exophthalmic goitre, which is due to over-action of the gland, or it may follow upon simple goitre, or after removal of the gland for any cause. It is allied to cretinism, which is a dwarfish idiocy due to congenital absence of the gland. The disease usually comes on after middle life, and slight degrees of it are probably commoner than is imagined, but when well marked it can scarcely be missed. The thickening and swelling of the skin is not infrequently mistaken at first for dropsy, but it does not pit on pressure with the point of the finger, leaving a depression for some little time, as dropsical swelling does, nor is there anything wrong with the urine as there is in Bright's disease. The face becomes pale and colourless, except for some redness on the cheeks; the lips, nose, ears, and eyelids swollen; the forehead wrinkled from the efforts to keep the eyes open; and the hands large and spade-like. The hair of the head and eyebrows becomes dry and brittle, and tends to fall out. The skin is very dry, the body temperature is always subnormal (96° F. to 97° F.), and the individual is very sensitive to cold. Not only is the expression dull, heavy, and stupid, but the mental condition also usually becomes one of placidity or even torpidity, or the individual may even be morose or suspicious. In women, if the menstrual periods have not stopped, they generally become excessive. If unrecognised and allowed to go untreated, the condition steadily becomes worse, the patient becoming very feeble in addition; but, if proper treatment is obtained, rapid and permanent improvement follows, even where the disease may have been present for years. The treatment consists in supplying artificially the deficient thyroid secretions, and this is now usually done by taking some preparation of sheep's thyroid. There are various preparations on the market, but tablets are generally found to be the most convenient. The dose required at first may be from 2 to 10 grains two or three times a day, but it is wise to have it taken under medical supervision at first, as it is easy to do harm by over-dosage, especially to cause heart failure. Once the person has been restored to normal health, the dose will probably be cut down to a couple of grains or thereby daily, or once or twice a week; but it is always necessary for the individual to go on taking some thyroid for the remainder of her life, or the symptoms will inevitably return if it be left off. It is also advisable that they should be well clothed, and sometimes advisable for them to go to a warm climate in the winter months, if that be possible.

Nævus.—See Birthmark.

Nails, Affections of the.—*Abscess of the nail,* or rather of the nail-bed, not infrequently results from an injury to the nail, or from a splinter of wood or other material being run in below the nail. In addition to the pus or matter which discharges, there is generally very severe pain, owing to the sensitiveness of the nail-bed and the tightness with which the unyielding nail is fixed down. Antiseptic hot fomentations (cloth wrung out of warm boracic lotion, or 1 in 60 carbolic lotion, and covered over with oiled silk) should be applied where there is any risk of such a thing occurring. If an abscess actually forms, it is necessary to have the nail split in order to allow of free exit for the pus. If this is not done, the pain may be unendurable, and there is also every likelihood of the inflammation spreading under the whole nail and subsequent loss of the nail, and perhaps a very unsatisfactory growth of a new one.

Injuries to the nail cause the nail to turn black from the presence of blood underneath it. If the hæmorrhage has been large, and has lifted the nail from its bed, the nail is practically certain to come off; but, unless there has been very severe damage, a new one should grow perfectly. This takes, as a rule, about six months, and during this period the nail is better to be protected by wearing a finger-stall.

The nails are not uncommonly affected by *various skin diseases.* The rest of the body (or portions of it) may or may not be affected at the same time. The nails tend to become thickened, rough, and opaque, and are frequently discoloured, but the appearances are by no means always distinctive of one disease or another, and, to make a diagnosis, it is often necessary to have a little bit of the nail scraped off and examined microscopically. Treatment is often very unsatisfactory, owing to the difficulty of getting any medicament into the nail, and we would advise that some specialist in skin diseases be consulted for such conditions.

The appearance of the nails sometimes indicates past or present disease or constitutional tendency towards some kind of ailment. Thus, the white spots which fortune-tellers make so much of generally indicate a temporary arrest of growth, usually due to some illness or depression in health. Longitudinal grooving of the nails is frequently seen in persons of gouty constitution, whilst transverse grooves point to some severe illness, with almost complete temporary cessation of growth.

Ingrowing nail is a condition practically limited to the toe-nails, and generally affecting the great toe. The main cause is too tight boots pressing the nail into the skin at the side of it, combined, possibly, with insufficient attention to the trimming of the nail and the allowance of dirt to accumulate under it, as this may set up an ulcerative condition at the sides of the nail. The nails should be kept cut short, but they should always be cut square across, and not trimmed down the corners. If they are cut square, it is difficult even for a tight boot to cause a nail to grow in. Should ingrowing have been allowed to occur, then loose-fitting boots must be worn, and, two or three times a day, a little piece of lint or linen should be packed down the side of the nail, between it and the skin, seeing, at the same time, that the place is kept thoroughly clean. The packing should preferably be soaked in a little boracic lotion and inserted moist.

Nausea.—See VOMITING.

Near-sight.—See under EYES, DISEASES OF THE.

Nerves, Diseases of.—Nerves are structures which are not the seat primarily of many diseases, the chief conditions to which they are liable being neuritis and neuralgia. When a person is described as being "nervous," "all nerves," or "a bundle of nerves," the trouble is not actually situated in those collections of nerve fibres running to the various organs and parts of the body which anatomically constitute a nerve, but in the nerve cells or centres in the brain. Such a condition may be the result of constitutional weakness of the nervous system, of disease of that system, or simply of partial, and, it may be, quite temporary, nervous exhaustion, and such conditions fall to be considered under nervous diseases or neurasthenia, not as a disease of nerves.

Neuritis means inflammation of a nerve trunk, and it may be a localised affair, affecting only one nerve, or it may be a multiple neuritis, affecting many nerves. Let us first consider localised neuritis. This most commonly results from exposure to cold, especially in persons of rheumatic or gouty constitution; occasionally it is due to injury of the nerve from a wound, bruise, or fracture, or to long-continued pressure, as from a tumour in the neighbourhood of a nerve trunk, or, as in the case of a person who goes asleep with the arm hanging over the back of a chair, and wakes to find some of the muscles of the arm paralysed. Two forms of neuritis are dealt with separately—viz. neuritis of the facial nerve, producing facial paralysis (*q.v.*), and sciatica (*q.v.*), which may either be a neuritis or a neuralgia of the sciatic nerve. The symptoms depend on whether the nerve affected is purely a motor one—*i.e.* carrying only stimuli to the muscles to make them contract, and thus produce movement (as is the case with the facial nerve); a sensory nerve—*i.e.* carrying only stimuli from the skin, &c., which give rise to sensations of touch, pain, heat, and cold, &c.; or a mixed nerve, containing both motor and sensory fibres. The motor symptoms are weakness or actual paralysis of the particular muscle or muscles supplied; the sensory symptoms, over-sensitiveness of the skin area supplied by the nerve, so that the lightest touch may be painful, or, in later stages, the part may be anæsthetic or numb. The outstanding symptom, however, is pain, usually constant and often very severe, along the course of the nerve. The nerve is very tender to pressure, and can sometimes be felt as a swollen cord. The pain elicited by pressure over it shoots down the course of the nerve, just as pinching the "funny-bone" (which is a nerve) at the elbow sends a sensation down to the little finger. The skin area supplied by the nerve is frequently red, and either swollen or else thin, smooth, and glossy, looking very like the skin over the scar of an old burn. The outlook in neuritis of this type varies greatly. Sometimes, with rest and proper treatment, recovery is rapid; in other cases many months may elapse before there is complete recovery. The treatment must be both local and general. If gout or rheumatism are playing any part in the causation, the appropriate remedies and measures must be employed. (See these conditions.) Locally the first thing that demands consideration is the relief of pain. Hot fomentations or poultices may be applied over the course of the nerve, or, probably better, because requiring to be changed less frequently, the part may be thickly smeared with an ointment composed of equal parts of ichthyol and vaseline, the whole limb being wrapped in lint or cotton-wool. The affected part must be kept perfectly quiet. In the case of the leg this means staying in bed (at least to begin with—later on a couch may do); in the arm it will probably be sufficient to use a sling, perhaps with the additional support of a splint. Some pain-killing drug is frequently necessary. Phenalgin may be taken safely, in 5-grain powders or tablets, every three or four hours. Morphia or opium preparations in any form should be shunned like the devil; there is no commoner starting-point of a drug habit than the use of these for the pain of neuritis or neuralgia. When the acute pain has subsided, but not until then, measures should be started to restore the functions of the nerve, and to bring back movement in the weakened or paralysed muscles. These consist in the application of electrical stimulation, and massage and movements of the joints. It is impossible to lay down directions for the use of these measures, as they will differ in almost every case, and must be left to the judgment of the doctor and masseur, or masseuse; but a rule generally followed is that the applications must be graduated in such a way as always to fall short of causing pain or producing tiredness in the part. It will generally also be advisable for the individual to take some tonic, such as Easton's syrup—one-half to one teaspoonful thrice daily after meals. (See also under PARALYSIS.) In the case of neuritis following injury to a nerve, it may be necessary to have an operation to unite the ends of a divided nerve, or to free the nerve from adhesions or pressure.

Multiple Neuritis.—This form of neuritis, affecting many nerves, is best exemplified by that form which comes on from chronic over-indulgence in alcohol. Similar results may come from chronic poisoning by arsenic, lead, nitro-benzene, bisulphide of carbon, &c., and multiple neuritis may also be due to toxins manufactured inside the body in such diseases as diabetes, diphtheria, beri-beri, &c. Adults are affected mainly, children very rarely, except, perhaps, after diphtheria. Let us describe alcoholic neuritis as the type-form. This can be diagnosed almost from one symptom alone—viz. extreme tenderness of the calves of the legs to pressure, the individual simply yelling with pain if the calves are pinched. This condition is more often met with in women than in men. It begins with cramps in the muscles, especially of the legs, tingling, and numbness; then there comes on the condition of extreme tenderness to touch or pressure, not only of the skin, but also in the muscles, as referred to above. A curious feature is the delay in perception of the pain; when the muscles are compressed, it is often several seconds before the pain is felt, but when perceived it is excessive. There is also weakness or paralysis of the muscles, giving rise at first to a high-stepping gait, then to foot-drop, and in the arms to wrist-drop. There is often also general tremulousness in the limbs. In bad cases the neuritis may extend to the nerves concerned with respiration, and to those going to the heart, in which case the outlook is grave, from the risk of heart-failure or pneumonia. The memory of individuals with multiple alcoholic neuritis is generally much affected, and there are often very vivid hallucinations.

In arsenical neuritis there is usually greater tenderness of the skin than of the muscles; there are usually rashes on the skin, and the eyes are red and watery. In lead neuritis the arms generally suffer most, giving rise to wrist-drop, and there may be no pain or disturbances of sensation. There will be other signs of lead-poisoning—colic, blue-line on the gums, &c. (See LEAD-POISONING.) The outlook in multiple neuritis is usually favourable if the patient can be prevented from getting any more of the poison which is causing the neuritis, although it generally takes from six to twelve months for recovery. Severe cases may be fatal. In alcoholic cases, complete seclusion of the patient in a home is necessary, as they cannot be trusted not to obtain and take alcohol by trickery, bribery, or any other means which comes handy. The patient will have to be entirely confined to bed for a considerable time; hypnotics and sedatives have generally to be administered; and, after the acute painful stage is passed, electricity and massage come into play, just as in the case of local neuritis.

Neuralgia means literally nerve pain, and, strictly speaking, the term should be confined to cases of pain in the track of some particular nerve, without actual disease of that nerve. Practically it is not always easy to do this, and there very often is disease, if not actually in the nerve, near it, or in some of the parts it supplies, which causes pain to radiate through its whole course. It is also not always easy to distinguish between neuralgia and neuritis, although in the latter the pain is generally more constant and long-lasting. Pain is, of course, the outstanding symptom of neuralgia, the pain being generally paroxysmal and often periodic—*i.e.* coming at certain definite times. It may be aching or shooting, and can be a mere tingling, or it may be agonising in degree. The whole course of the nerve is not usually tender to pressure, but there are often definite tender points. There is sometimes loss of feeling in the skin of a neuralgic area, whitening of the hair, or twitching of the muscles, but there is practically never paralysis of the muscles as in neuritis. The causes of neuralgia are often constitutional. Anæmia is such a common one that neuralgia has been described as the cry of the nerves for better blood. Gout and rheumatism may also be responsible, just as they may be for neuritis. Any depressed mental or physical state in a person of originally nervous constitution may be quite sufficient to set up neuralgia. The immediately exciting cause is to be sought for among such things as exposure to cold, a decayed tooth, eye-strain, a scar nipping an end of the nerve, gastric derangements, &c. Malaria, influenza, and other fevers may be followed by neuralgia, and it may both precede and follow an attack of shingles. The diagnosis of neuralgia usually presents little difficulty, but it is not by any means always such an easy matter to discover the reason for it, nor yet to get rid of the cause and cure the disease. The commonest kind of neuralgia is that affecting the fifth cranial nerve, the sensory nerve of the face, or, as it is called, "tic douloureux." This nerve has three divisions, any one or all of which may be affected. If the uppermost division is involved, there is a special painful point near the inner end of the eyebrow, the eyeball is usually tender, and tears may flow freely. With the middle division there is a tender point about an inch below the eye, the upper teeth generally ache, and there will often be found a decayed tooth or some trouble in the nose responsible for the neuralgia. The third division sets up pain in the lower teeth, and sometimes earache, and the lower teeth and ear should be examined specially.

Neuralgic pains in the arms are not infrequently associated with writer's cramp or some other form of spasm of occupation (see CRAMP), if not caused by rheumatism, gout, or anæmia.

Intercostal neuralgia, round the chest, has three tender points—one near the spine; one at the side, in line with the middle of the armpit; and one at the side of the breast-bone. It is often associated with shingles. (See SHINGLES.)

For neuralgia of the sciatic nerve, at the back of the hip and leg, see SCIATICA.

Neuralgia in the sole of the foot, or about the base of the toes, is generally associated with flat-foot, or due to the pressure of tight or ill-fitting boots.

Treatment.—As in the case of neuritis, the treatment should be twofold—firstly, for relief of pain; secondly, for removal of the cause. If the latter cannot be discovered and got at, attacks of neuralgia will be liable to return, it may be for many years, and all that can be done is to give relief when present. Persons subject to neuralgia should therefore be thoroughly overhauled, and any such cause as gout, rheumatism, anæmia, malaria, or anything wrong with the eyes, ears, nose, teeth, stomach, or general health rectified as far as can be. For the relief of the pain, a menthol cone may be rubbed over the painful area, but this will only serve in mild cases. An ointment composed of one drachm each of chloral and camphor in an ounce of vaseline is generally more efficacious. A mixture of equal parts of the liniments of aconite, belladonna, and chloroform, usually known as ABC liniment, rubbed or painted on, is also a useful remedy. Internally the same pain-killers may be used as are employed for headache, and the same precautions and remarks as to safety apply here as are mentioned in connection with headache. A little alcohol, such as a small whisky and hot water, will frequently be found to give prompt relief in neuralgia. In facial neuralgia particularly, butyl-chloral hydrate (10 to 20 drops in water) often acts particularly well. In old people neuralgia is sometimes due to a spasm of the blood-vessels, and such neuralgias are apt to be very severe; the best remedy in such cases is often a dilator of the arteries, such as nitrite of soda (24 grains dissolved in 3 ounces of water; dose, one to two teaspoonfuls every four hours). The mere application of warmth will often relieve the pain; less frequently, cold applications have the same effect. The fact that we have mentioned so many remedies is evidence that no single one is certain, and that the changes may have to be rung from one to another to gain relief. In more persistent or chronic cases some form of counter-irritation is advisable, such as, for instance, the application of blisters, or sometimes actual touching with a button cautery.

Baths, electricity, and hot-air applications also have their uses in such cases. Some cases will be found to defy all remedies, and the only way in which the patient can get relief is to have the nerve destroyed by injecting substances into it, or by having it excised. Such procedures are not to be undertaken lightly, but the pain may be so intolerable as to make life unendurable if something of the kind is not done.

A rare form of neuralgia is that known as erythromelalgia, in which there is a bright-red condition of the palms or soles along with neuralgic pains. There is no special treatment for this form, but elevation of the affected limb or limbs, so as to diminish the blood supply, will be found useful, in addition to the other measures applicable as in ordinary neuralgia.

Nervous Debility.—See NEURASTHENIA.

Nervous Diseases.—Diseases of the nervous system are without doubt the most difficult, in many instances, to diagnose, the symptoms being so varied, and the number of possible affections being so large. It is impossible, within the limits of such a work as this, to do more than merely indicate the symptoms pointing to some disease of the nervous system, be it brain, spinal cord, or nerves. A number of the more prominent affections, with fairly definite symptoms, are dealt with separately. (See under such headings as APHASIA; APOPLEXY; BRAIN, DISEASES OF THE; CATALEPSY; CHOREA; CRAMP; EPILEPSY; HYSTERIA; IDIOCY; INSANITY; LOCOMOTOR ATAXIA; MENINGITIS; NERVES, DISEASES OF THE; NEURASTHENIA; PARALYSIS.) The following are the chief symptoms found in diseases of the nervous system; naturally only a few of them are likely to be present in any particular case, and it is only from the grouping or association of the particular symptoms present that a physician is able to determine what and where the disease exactly is. Sometimes it may be obvious at a glance, but frequently it is only after thorough examination, and possibly only after repeated examinations, at some interval, that it is possible to arrive at a definite conclusion.

1. Changes, or something unusual about the behaviour, or intellectual capacity. Marked changes in conduct usually point rather to mental disorders or insanity, but slighter changes are not infrequently present in nervous disorders, while simple nervousness, excitability, emotionalism, or loss of memory may be present in hysteria or neurasthenia, and also in some definitely organic diseases of the nervous system.

2. Unconsciousness, coming on suddenly or gradually, is a symptom of some of the severer affections, particularly of the brain. In adults it is most commonly due to a hæmorrhage into the brain, in young persons meningitis is the most likely cause. It may, of course, be due to rupture of a blood-vessel inside the skull, and the formation of a clot of blood which presses on the brain; this practically never occurs except as the result of an accident, such as a fall or a blow, and there may or may not be fracture of the skull. It may also be due to poisoning, especially by opium or alcohol, or it may be the coma apt to come on as the termination of diabetes or Bright's disease (uræmic coma), or it may be due to heatstroke, in which case there will be the definite history of exposure to the sun or intense heat.

3. Fits, convulsions, and other kinds of involuntary movements. Definite fits occur chiefly in epilepsy and hysteria. Fits very like those of epilepsy occur also in general paralysis of the insane, and sometimes in cases of brain tumour. For a further consideration of these, see under the individual headings. Convulsions in children are fits not unlike those of epilepsy. Sometimes these are due to disease of the nervous system; more commonly they are due to some kind of irritation in weak or rickety children; or they may be the

equivalent of a shivering fit or rigor in an adult at the commencement of some feverish attack. (See CONVULSIONS.) Tremor—a more or less constant, fine, shaky movement in the muscles of the limbs, or of any part of the body—may be seen in conditions of temporary fatigue, in exophthalmic goitre, in disseminated sclerosis (a disease of the brain and spinal cord), in chronic alcoholics or in acute delirium tremens, in old people without any definite disease, and in paralysis agitans, or the shaking palsy, in which the movements generally commence with the characteristic pill-rolling movement of the thumb and forefinger. Irregular twitching movements occur chiefly in chorea or St. Vitus' dance, also as various kinds of habit spasms or "tics." (See under TREMOR and CHOREA.)

4. Aphasia, meaning loss of the power of speech, or of understanding spoken or written speech, is due to some definite brain disease. (See APHASIA, and BRAIN, DISEASES OF THE.) Difficulties of articulation, if not due to cleft palate, sore throat, or disease in the larynx, are sometimes also due to disease affecting the nerves controlling the speech muscles or their centres in the brain. The articulation in general paralysis of the insane is very like that of a drunken man. In the disease known as disseminated sclerosis the speech often has a peculiar jerky, mincing, or staccato character, and there is a peculiar form of tremor which only comes on in the performance of a movement, but is absent when at rest. Stammering is sometimes due to defective working of the brain mechanism of speech. Complete loss of voice may occasionally be a purely hysterical symptom.

5. Disorders of the cranial nerves, or nerves coming directly off from the brain, are not infrequent in brain disorders. They may also be due to involvement of these nerves as they pass through the meninges or coverings of the brain, or arise from actual disease in these nerves themselves. The chief symptoms which may arise from affection of them are as follows: loss of the sense of smell; defective vision, or even blindness; irregularities or inequalities in the size of the pupils, loss of the reaction or dilation of the pupil to a bright light, squints, double vision, nystagmus or involuntary twitching movements of the eyeballs (usually from side to side), drooping of the upper eyelids; paralysis of the face; deafness, ringing noises in the head, or giddiness; paralysis or wasting of half of the tongue.

6. Pain, or some form of disturbed sensation, is one of the commonest symptoms of nervous disorder. Pain, although always, of course, felt through the nervous system, does not in itself necessarily mean that the source of it is in the nervous system; but headaches, neuralgic pains, lightning or shooting pains, and milder varieties of pain, such as tingling, itching, "pins and needles," &c., may be due to actual disease of the nervous system. Other forms of disturbance of sensation arising from disease interfering with the proper conduction of sensory stimuli in the sensory nerve fibres are numbness, or complete loss of sensation. This loss of sensation may be for all qualities of sensation—touch, pain, heat and cold, sense of shape of objects, of position of the body, and of movement—or it may only be for some of these different qualities of sensation. In investigating a case of nervous disorder, all these must be tested for separately. Undue sensitiveness to touch, pain, or other sensory stimuli is spoken of as hyperæsthesia, loss of sensation as anæsthesia, perverted sensation, where things are felt differently from what a normal person perceives them, as paræsthesia.

7. Another of the commonest symptoms of nervous disease, and one of the most readily perceived, is loss of power in some part of the body, or actual complete paralysis. Loss of power or paralysis is often accompanied by wasting of the muscles; sometimes the paralysed part is flaccid or flail-like, in other instances stiff, and frequently contracted. Other affections of movement are inco-ordination or imperfect control of movement (such, for instance, as a drunken person exhibits), and peculiarities of posture and gait. (See PARALYSIS, and GAIT, DISTURBANCES OF.)

8. Disturbances of the reflexes are amongst those constantly tested for or inquired about in the examination of the nervous system. One of the most familiar "reflexes" is the knee-jerk—the little throw-up of the foot obtained when one leg is crossed over the other and the tendon below the knee-cap tapped sharply. In some disorders this is greatly exaggerated, in others diminished or lost altogether. The reflex (automatic movement) obtained by firmly stroking (not tickling) the sole of the foot is another of those commonly tested for. As a rule there should only be produced a bending down of the great toe. In a number of disorders the action is reversed, and the great toe is bent upwards. Other reflex acts which may be disturbed in nervous diseases are the movement of the bowels and bladder, either retention or loss of control and dribbling away of urine, and possibly also of fæces.

9. Various other symptoms amongst which may be merely mentioned changes in the reaction of the muscles to electricity. This, of course, can only be made out on examination by the doctor.

The causes of diseases of the nervous system are probably as varied as the diseases themselves, and in many instances they are not very definitely known. Some are deep-seated constitutionally, or even racially, if we may judge from the fact that hysteria and general nervousness or neurotic tendencies are definitely more marked in certain races than in others. Hereditary influences certainly play a great part in many instances, not only in the production of "functional" diseases, such as nervousness, epilepsy, hysteria, and neurasthenia, but also in some of the organic diseases, where there is definite tissue changes in the nervous system. In some cases we can only suppose it is a weakness of constitution of the nerve cells which is inherited, a weakness which may lead to nervous breakdown or actual disease if the individual be subjected to too great strain in any way in later life, but which, on the other hand, does not necessarily lead to any manifestation if the individual is well brought up and leads a healthy life, neither living too fast nor too hard. In such individuals ill-effects are very likely to come on if they are subjected to too great a strain either in their work or in their social life, in love or in religion, or from any sudden shock either to mind or body. In other cases there seems to be actual disease or developmental defects inherited, and then, of course, the outlook is less favourable.

The nervous system, being the most highly developed and specialised of all the tissues, is also the most delicate and easily affected by any poison circulating through the body, whether the poison be formed within the body or introduced from without. Chief among these "nerve poisons" are alcohol and syphilis, the toxins of which cause much nervous disease, not only in the affected individuals, but also, it may be, in their children. Lead is another chronically acting poison acting on the nervous system. Many acute diseases have temporary effects, while some acute infective diseases exert their main influence on this part of the body—*e.g.* meningitis and infantile paralysis.

Another group of conditions is due to changes, and disease, not so much of the nervous system itself, but of the blood-vessels carrying its blood-supply—namely, such conditions as apoplexy and softening of the brain.

Treatment.—This cannot be gone into in any detail, because it must necessarily vary much according to the exact nature of the disease. In many instances it must be confessed that the treatment of nervous disorders is very disappointing or even hopeless, the structure of nervous tissue being so specialised that, if damaged by disease, repair of it is, and probably always will remain, an impossibility, whatever advances be made in our knowledge. On the other hand, brilliant results follow skilful treatment in some instances, whilst in many, perhaps the majority, of cases, the progress of the disease may be at least arrested, or, at the very worst, the symptoms may be considerably alleviated, so that the outlook in a case of definitely developed nervous disorder, if not always bright, need not be too despairing. Remedial measures of all kinds come into play in the treatment of nervous disorders—drugs, diet, rest, exercises, massage, surgical operations, electricity, baths, and other physical methods, and lastly, but by no means least, mental and moral influences directed towards the building up of the patient's powers of restraint and self-control. It will probably be of more service if we indicate the lines on which nervous disorders should be guarded against in those whose inheritance predisposes them to troubles of this description—especially to "functional troubles," such as general nervousness or neurasthenia—because upbringing and surroundings can certainly do a great deal to counteract the evils of a bad heredity. With regard to the more immediate causes of nervous diseases, some are beyond our control, others are not. We cannot, for instance, prevent accidents happening, nor always arrange that exposure to cold and wet shall not occur, but excesses *in vino* and *in venere* can be avoided. With regard to syphilis, it is all-important that, if acquired, treatment should be very thorough and prolonged; its manifestations in the nervous system may be delayed for many years after the primary attack, but they should not come on at all if treatment has been carefully and completely carried out. Diseases in which there is actual developmental errors are also beyond our aid to a great extent, but in those conditions where it is merely an instability of nervous constitution which has been inherited much can be done, but to be done properly the treatment or training must begin with the child. If the parents are of a nervous temperament, then the chances are that the children will be also. Neurotic or nervously-inclined children are often small in build, alert and restless in manner, emotional, excitable, quick at lessons, but not usually capable of persevering efforts. In such children there are great potentialities for good or evil; with care they may become brilliant men or women, even geniuses, but for every genius there are thousands of degenerates, either in a mental, moral, or physical sense, depending on whichever part of the nervous system gives way. A neurotic mother is probably the worst possible person to bring up her children, as all her wrong propensities are sure to be copied by the imitative child; but it is seldom possible to get her to realise this without offence, nor yet practicable, although desirable, to have the children mainly under the control of some sensible nurse or friend. The life of such a child should be one of regular orderliness, with plenty of open air. Friendships and games with other children should be encouraged, but theatres, parties, and such-like excitements are not good. Every encouragement should be given to stimulate interest in natural history, plants, gardening, machinery, &c., and any tendency to subjective brooding and introspection discouraged. The food ought to be simple, plain, and fattening rather than stimulating; in fact, the gospel of fat should be preached and practised with such children, their dietary consisting chiefly of milk, eggs, porridge and farinaceous foods, meat playing a much more subsidiary part. Nine or ten hours' sleep is none too much. Cold baths or cold sponging in the morning can be started at an early period, and should be indulged in regularly. The management of the child must be firm yet kindly, and, above all, fair. The commonest mistake is to spoil the child by indulging every wish, but it may be just as harmful to crush the child's spirit by too inflexible rules. Let it learn, as far as possible, by the hard but wholesome road of experience. To obtain a well-balanced mind the child must be taught to keep the passions under control, and to face pain, which is a great educator, and which neurotic children feel keenly, with bravery and in silence. Sentimentality must be nipped in the bud, although this must not be taken as meaning that the use of the imagination and the exercise of humour is to be stifled altogether—far from it. In all but a very few cases school is better than education at home, but it should be borne in mind that a good, healthy, manly tone in the school is of far greater importance than mere teaching power. The neurotic child usually takes a high place in school work easily, but the stimulus of competitions may do great harm and lead to an early exhaustion of nerve energy. The adult brain can hardly overwork itself, as it mechanically kicks and refuses to work until it has had a rest; but it is otherwise with the nervous system of a young person, and the risk of overdoing it at school in the way of work is probably considerably greater in the case of girls than of boys. With regard to the choice of an occupation in after-life, it may be said broadly that those occupations which give most open-air life and involve least mental responsibility and nerve-racking strain are those to be recommended. Unfortunately it is just those which give promise of most excitement which will probably appeal most to the neurotic temperament, and, if the call is too strong, one can only trust that the early training will have been sufficiently strong to give a balance to the nervous system which will stand the wear and tear. See also under INSANITY, and under the individual diseases and symptoms which are mentioned as being treated separately.

Nervousness.—Persons of a nervous temperament—or "neurotic individuals," as they are commonly called in modern parlance—are persons whose nervous system is high-strung or in a constant condition of rather unstable equilibrium. The majority of persons whose mental powers are above the average probably come under this category, but the price which they have to pay in many instances is an instability of the nervous system, which may show itself in insanity, nervous disorders, simple nervousness, or a readiness to suffer from exhaustion of nerve energy or neurasthenia. For further consideration see under NEURASTHENIA, and, for preventive measures, under NERVOUS DISEASES—*Treatment.*

Nettle-rash, or *urticaria,* is an eruption of the skin, characterised by the development of raised white wheals or white and red patches over the whole or part of the body. These patches are similar in appearance to the effects produced by the sting of a nettle; they are very itchy and irritable. Nettle-rash is most commonly the result of some dietetic disturbance, especially in children, in whom it may appear after almost any unusual rich feeding, along with feverishness and sickness. Certain articles of food are specially liable to produce such a rash, in adults as well as in children—namely, shellfish, fruit, and cheese—but some individuals show peculiar idiosyncrasies, and get nettle-rash after certain kinds of food which can be taken with impunity by most people. White of egg, for instance, in any form, has this effect on some people, and many other curious examples might be quoted. Certain drugs also are liable to bring out an urticarial rash—*e.g.* copaiba, turpentine, and henbane. Nettle-rash may also be a more chronic affection, the rash lasting or coming out at intervals over a long period, independently of any errors of diet, and, in such a case, without any fever or sickness. In the ordinary acute cases the swelling accompanying the outbreak of the rash on the face is often rather alarming to those unacquainted with the nature of the condition, but it does not, as a rule, last more than a few hours, or a day or so at most. The best treatment for nettle-rash is a good dose of some antacid, such as bicarbonate of soda (a small teaspoonful dissolved in a little water). The itchiness may be relieved by sponging either with some 1 in 60 carbolic lotion, or with a solution of bicarbonate of soda (a teaspoonful to a tumblerful of warm water). In recurrent cases, look either for special sensitiveness to some article of diet, or consult a doctor to see whether there is not some constitutional cause.

Neuralgia.—See under NERVES, DISEASES OF THE.

Neurasthenia.—This is a condition of temporary, but more or less complete, nervous exhaustion, due to excessive mental and nervous strain. It is a condition which one hears a lot about nowadays, and one which is not likely to become less frequent unless life ceases to be lived at such high pressure. Worry is perhaps one of the most potent factors in the causation of neurasthenia, so that the advice "Don't worry" is eminently good—if it can only be followed! In men, business worries are the commonest source of a nervous breakdown; in women, "working" too hard at social pleasures, or perhaps the strain of nursing some relative through a long and trying illness. An inherited nervous temperament is an important element in the causation of neurasthenia. Neurasthenia is not met with much amongst those whose work may, indeed, be hard, but is purely physical and involving no mental strain. It may, however, come on in any one subjected to any over-work along with mental strain. It assumes its severest forms in those of a nervous constitution, and is more difficult to cure in persons of that type, those of a more phlegmatic type breaking down less easily and responding better to treatment. Neurasthenia may also result from illness, accident, or physical shock.

The symptoms may be very varied, both in kind and degree, but there is constantly a sense of fatigue, of exhaustion, and of irritability, varying from a state of being merely somewhat run down to one of complete nervous collapse. The symptoms are both mental and physical, sometimes the one, sometimes the other, predominating, and in some cases there is a marked hysterical element present as well. Mentally there is loss of power of concentration on work, and the memory is generally defective, although the patient's own symptoms can usually be described minutely and at great length. There are no delusions, but commonly extraordinary fears and dreads of various kinds. The patient realises the senselessness of these in most cases, but is nevertheless quite unable to throw them off. There may be emotional excitement, but more commonly the individual is depressed and down in the dumps, sometimes very badly so. The condition may indeed pass over into actual insane melancholia; there is no definite and sharp dividing line, although in insanity we expect definite delusions to be present. Insomnia is a common feature, the patient being always sleepy, but cannot sleep, and what sleep is obtained is apt to be disturbed by bad dreams. Headache of a dull type, either at the back of the head or all over the head, and a tired, aching back, are common. The eyes readily become tired with reading. Perspiration generally occurs freely, either all over the body, or locally on certain parts. The skin flushes readily, the pulse is often throbbing, and the action of the heart may be rapid and irregular, and palpitation is complained of. Digestion practically always suffers; the patient has no appetite, and can't be bothered with food, but may be tempted with spicy made-up dishes when he will not look at a solid meal. The stomach frequently becomes dilated, and, after taking any food, digestion is slow, and there is a constant feeling of heaviness in the stomach. The urine often shows a white- or pink-coloured deposit on standing, and there may be a movable kidney—this condition being, indeed, a well-recognised cause of neurasthenia in women. The perusal of certain German works would lead one to suppose that sexual excesses, either of a natural or an unnatural kind, were the chief cause of neurasthenia. While by no means denying that such excesses do lead to nervous exhaustion, there can be little doubt that the emissions so commonly complained of in men, or the painful and irregular menstruation in women, are more a result of the neurasthenia than a cause, and that, the less attention paid to sexual matters by the patient, the better it will be.

Treatment.—For treatment to be successful the diagnosis must, in the first instance, be correct, and it is always wise for a patient who thinks he suffers, or is thought to be suffering, from this condition to seek the advice of a good physician, one in whom he has absolute trust and confidence, and whose advice he is prepared to follow. True neurasthenia is purely a functional disease—*i.e.* there is nothing wrong with the machinery, but merely a lack of energy to run it properly—but mistakes may be made, and the neurasthenic or run-down condition accompanying some underlying organic disease mistaken for the functional. A thorough examination should avoid this error; but, even when the diagnosis is correct, guidance is generally necessary, and for cure to be effective there is perhaps no other disease except hysteria (another functional complaint), in which faith in the treatment and the healer is so necessary, and in which a tactful and managing doctor will succeed where another, perhaps possessing more knowledge but less wisdom, will fail. In the first place, in the milder degrees of the condition, getting at the immediate cause may be sufficient. The brain of a man working hard, but free from anxiety, tends to limit its work automatically, and the possessor of it, when he finds himself becoming irritable, going off his sleep, and doing work of poor quality, is a wise man if he knocks off and takes a holiday for a day or two. When anxiety or worry is added, be it for bread and butter, a high place in examinations, or anything else, it is not so easy always either giving or taking advice. It is worse than useless to go away from home and take all one's worries with one. A certain amount of daily exercise will not infrequently prevent a breakdown occurring, and let it be said here that a walk to and from business, during which all one's plans and worries are being gone over and over in the troubled brain, is decidedly not exercise. Something is required to take one completely out of oneself, and, although individual tastes will dictate different means of doing this, golf is, on the whole, probably the beau ideal. A certain amount of suitable exercise, limitation of work, and perhaps a holiday, may therefore be sufficient in some instances. In accident cases—traumatic neurasthenia—large compensation is generally the best cure, and we say this in all seriousness; for the neurasthenia coming on after accidents is by no means always "put on" to gain compensation, but may be a real condition, but one which the worry of an unsettled lawsuit makes impossible to cure, and which may even become more permanent if the suit be lost. High frequency or static electricity often works wonders in treating neurasthenia of moderate degree of severity. Special symptoms may require individual treatment, such as dyspepsia, sleeplessness, &c. (see these headings), but the mode of treatment which is found to be most satisfactory in cases of any severity is that introduced by Weir-Mitchell, and which generally goes by the name of a "rest-cure." The strictness with which this needs to be carried out, and the details in any particular instance, must vary, for there is no cut-and-dried plan suitable to every one, but the general lines on which it is based are as follows. There are four factors in the treatment—isolation, rest, massage, and feeding. The need of a certain amount of isolation or solitude is felt even by the ordinary healthy being, but here it plays a very important part in the treatment. It can seldom be carried out at home, and no physician with any experience of such cases would attempt treatment of a severe case at home, except under very exceptional circumstances. Some suitable nursing establishment is practically a *sine qua non.* In a case of any severity the isolation must be complete for something like six weeks; no friends are to be seen, and no letters written or received; the patient's whole world, in fact, must consist of the doctor and the nurse, or nurses. It is of equal importance that the latter should also be *en rapport* and in full harmony with the patient, or the influence of the doctor may go for naught. During this period the patient is put to bed and kept there rigorously for probably a month; then he may be gradually allowed, first to sit up for a few minutes, then to walk a little in his room, then to go for a drive, and lastly to walk outside. But the mind requires rest as well as the body, and—during the early stages, at all events—the patient is not allowed to indulge in any general conversation, and probably to do no reading. The conversation of the nurse and doctor are directed towards removing mental worries and fears, and they must be very patient, as they often have to go over the same ground again and again with the patient. Taking the place of exercise, enabling the patient to be fed abundantly, and generally bringing about a feeling of wellbeing, is massage. This is usually begun about the third day, the whole body being massaged, at first for a quarter of an hour daily, increasing this to one hour, and then, after a week or ten days, to about three-quarters of an hour twice daily. The diet during the first few days consists of milk only, about 3 ounces every two hours, increasing gradually until 4 pints are being taken daily. After a week some ordinary dishes are added, until in a fortnight or so the patient is taking three full meals a day plus the 4 pints of milk. It is only with massage and careful attention to the bowels, and sometimes giving a little medicine with the meals for dyspepsia, that this over-feeding is possible, but it is wonderful how it can be managed even with persons who could scarcely eat at all before the commencement of their cure. Fat neurasthenics, who occasionally but very rarely occur, and to whom this treatment is not applicable, present a much more difficult problem to the doctor to treat. In addition to these measures the patient may get baths, electric treatment, medicines, or other measures, according to his particular needs. Patients, and, perhaps more particularly, patients' friends, are sometimes rather fearful of rest-cures, dreading the loneliness and fearing that it will be terribly dull. Well, at first, possibly, it is a little bit; but a certain vegetativeness of existence is just what the patient is requiring to give his brain an opportunity to recover its tone. During the later part of the cure this will not be complained of, because the patient's time is so fully occupied with all the different parts of the treatment that he has no time left to hang heavy on his hands. After the actual "cure" is over, it is generally advisable not to return to work immediately, but to go to the country for a little (preferably the hills), or, perhaps, to travel for a little—not, of course, rushing over the world too quickly, seeing how much can be done, but leisurely and lazily.

Neuritis.—See under Nerves, Diseases of.

Neuroses, or *neurotic disorders,* mean nervous disturbances which have, so far as can be made out, no underlying gross disease of the nervous system. In other words, the complaint is a purely functional one. In its mildest degree the neurotic disposition shows itself merely as nervousness and a high-strung temperament. Hysteria and neurasthenia are two of the best-marked more advanced neurotic diseases. (See these conditions, and also under Nervous Diseases.)

Nightmare, and other Forms of Night Terrors.—A condition met with chiefly in nervous and weakly children, but occurring sometimes in children who are quite sound and strong. Children who have not arrived at the time of getting their second teeth are most likely to suffer. The child goes to bed apparently quite well, but in the early hours of the night wakes up screaming with fright and crying. It may be a quarter of an hour or so before it become properly conscious of its surroundings, when it will usually cry itself to sleep again. In the morning all recollection of the event has often passed away. There is seldom more than one seizure a night, but for months the condition may tend to return. The main treatment consists in seeing that the child does not go to bed with an overloaded stomach, and, in cases where nightmare is recurrent, no meal should be given for two or three hours before bedtime. The child should also be examined for any such source of irritation as worms, adenoids or enlarged tonsils, or a tight prepuce. If no such cause can be found it is often advisable to give some sedative drug at bedtime, such as 5 to 10 grains of bromide of sodium dissolved in a wineglassful of water. The child had better not be allowed to sleep alone, nor be without a light in the room, until a cure is established.

Nipples, Diseases of the.—See Breasts, Diseases of the.

Noma, or Cancrum Oris.—A rather rare condition, seen most frequently in children after measles, in which a large part of the cheek may be eaten away. The condition is a very dangerous, and indeed generally fatal one, and the only hope of recovery lies in removal or destruction by strong caustics, such as pure nitric acid, of the tissues for some distance round and wide of the affected area, a proceeding which naturally leads to hideous deformity. (See also Mouth, Diseases of the.)

Nose, Affections of the.—The exterior of the nose is liable to suffer from the affections common to the skin generally, but there are one or two conditions specially apt to affect the skin of the nose, to which special attention may be directed.

Ordinary acne is very common on the nose, especially in the greasy skin about the folds at the sides of the nose. This is almost exclusively a disease of young adults, and the treatment here is exactly the same as that of acne or blackheads on the rest of the face. (See Acne.) This disease, known sometimes as acne rosacea, but now more commonly simply as *rosacea,* specially affects the skin of the nose and cheeks, although the forehead and chin may also be involved. This condition is often spoken of simply as red-nose. The nose, however, is not necessarily in a constant condition of redness—at least, not in the early stages of the disease—but it very readily flushes on taking any hot or stimulating fluid. This disease is often attributed to over-indulgence in alcohol, and, when little pimples or pustules form on the reddened skin, as not infrequently happens, they are rather contemptuously spoken of as "grog-blossoms." While not denying that alcohol, by its dilating action on the blood-vessels of the skin, may contribute to the development of rosacea, it must be stated in all fairness that tea, curries, and condiments of all kinds are just as harmful, and that dyspepsia is probably a more potent cause than any of these. But underlying all cases is an inflammation of the oil-glands of the skin, or seborrhœa, the same disease which on the scalp is the most fruitful source of dandruff and baldness. For treatment to be successful this seborrhœa must be attacked, especially on the scalp, which is generally the *fons et origo* of the trouble. It will require washing with soap spirit, and the constant application of sulphur or salicylic ointments, as described under Baldness, whilst on the face the following lotion should be dabbed on several times a day and allowed to dry in:

℞ Precipitated sulphur	3 ounces
Calamine	3 ounces
Glycerine	1 drachm
Water	to six ounces

Make a lotion. Shake before using.

The general treatment consists in paying special attention to the bowels so as to prevent constipation; treating any dyspepsia which may be present on appropriate lines (see Dyspepsia); and, as regards diet, avoiding everything which experience has shown to produce flushing of the face, especially those articles mentioned above in referring to the causation of the disease. If the condition has been allowed to last for a considerable period, probably the dilated veins will be so large and prominent as to be beyond the reach of drugs, and in this case electrolysis or burning with a dull-hot needle will be found to be the most satisfactory method of cure. Naturally this is a mode of treatment which will only be carried out by some one with some experience of the method.

Hammer-nose, or *rhinophyma,* is the most exaggerated stage of rosacea; in this the nose becomes greatly overgrown, and has large, protuberant masses, covered with greasy skin, with dilated veins coursing all over them. It gives a very distressing appearance, but is really very amenable to cure by surgical means, the nose being pared down to its natural shape, and in about a fortnight the patient is able again to be going about.

Lupus commonly starts inside the nose, and may be present there for some little time before it makes its appearance on the skin surface. (For further description see LUPUS.) The deformity resulting from lupus which has gone on for a long time—sunken bridge, or, indeed, almost complete disappearance of the nose—is sometimes remedied by a surgical operation, in which a new nose is built up for the patient. A similar operation can be performed for destruction of the nose from any other cause, such as accident, syphilis, or rodent ulcer (a form of cancer of the skin, seen most often on the face, commencing about the corner of the mouth, nose, or eye). (See RODENT ULCER.)

Injuries to the nose, with fracture of the nasal bones, depression of the bridge, or displacement of the nose to one side, should be seen to, and any displacement righted as soon as possible after the injury. It is comparatively easily done, usually under light anæsthesia, if seen at once, and the results are generally very satisfactory in every way; but if time elapses, the bones and cartilages become fixed in the wrong position, and nothing short of operation will then put them right. It is not merely for the sake of the appearance it is important that this should not be allowed to occur, but because any displacement is certain to cause some obstruction to the airway of the nose, which in its turn leads later on to difficulties with breathing and changes in the mucous membrane of the nose, which may be very troublesome. In young people the obstruction to breathing may even produce stunting of growth and dulling of the mental faculties, much in the same way as obstruction from adenoids. Sometimes no external injury to the nose is apparent, but the septum between the two nostrils is driven considerably to one side. Deviations of the septum may also arise from other causes—in fact, it is probably never exactly in the centre—but when the deviation is at all considerable it causes obstruction, and should be rectified by a little operation. Noses whose shape is not pleasing æsthetically are not infrequently improved by the injection and moulding of paraffin wax under the skin, sometimes with very satisfactory results.

Apart from the perception of smell, the main function of the nose is to warm, moisten, and purify the inspired air before it passes down into the lungs, and *obstruction to breathing*, with all the many ill-effects which may follow in its train, is therefore the commonest symptom resulting from disease within the nose, whatever its nature. While mouth breathing can warm the inspired air, it is only at the expense of great effort, as is readily perceived if one sits still and imitates the rapid breathing of a man running a race, and notices how soon the mouth and back of the throat begin to feel dry and stiff. The evil effects of mouth breathing, when constantly carried on, are best illustrated by reference to ADENOIDS, which is one of the commonest affections of the nose—an overgrowth of the tissue at the back of the nose. The constant running at the nose, sniffing, open mouth, dull, heavy expression, poor development of the chest, mental stupidity, and liability to more serious chest diseases, should be a warning to every one to see that children are not allowed to get into the habit of mouth-breathing, but that deep nose-breathing should be taught them, and that any obstruction to nose-breathing should be promptly removed. A healthy nose is an asset which renders one almost indifferent to climatic conditions, whereas a mouth-breather can only live with any comfort and freedom from constant colds in a warm and fairly moist atmosphere.

Acute Inflammation of the Nose.—This generally takes the form of a catarrh, and is ordinarily known as "a cold in the head." It may extend from the nose proper into the various cavities in the bones surrounding the nose, producing aching in the brow or face, and it may spread up the tear-duct to the eye, producing conjunctivitis, or along the Eustachian tube, causing temporary deafness, and possibly a middle-ear catarrh. (For further consideration and treatment see under COLDS IN THE HEAD.) *Diphtheria* may occur in the nose with the formation of a membrane, sometimes primarily, but usually as an extension of the diphtheritic inflammation from the throat. It is rather a serious complication, but the treatment is in nowise different from that of diphtheria generally. *Erysipelas* may occur *in* the nose or *on* it, being especially liable to occur after injuries to the nose; so that, in the case of an injury to the nose, not only is it advisable to have the bones set at once, but it is usually advisable to douche the nose with some antiseptic lotion for some days afterwards, perhaps the best being a few teaspoonfuls of peroxide of hydrogen, diluted with an equal amount of water, used several times a day. (See DIPHTHERIA and ERYSIPELAS.) *Hay-fever* may also be regarded as a peculiar form of acute inflammation of the nose. (See HAY-FEVER.)

Chronic Inflammation in the Nose, or Chronic Rhinitis.—This takes various forms, and it will be advisable, as a rule, for the patient to have the nose examined, because the chronic catarrh is, in probably the large majority of instances, but a sequel to some form of obstruction within the nose. The symptoms, generally speaking, are those of a more or less constantly present cold in the head, with running at the nose and a feeling of stuffiness within it. This feeling of obstruction within the nose is generally worse at night, when the head is low. The nose may become large and red, hearing is often impaired, and there may be neuralgic pains in the nose. There will often be a history of repeated attacks of acute colds as a start of the condition, but, on examination of the nose, it is very frequently found that there is some obstruction—either a deviation of the septum, spurs of bone growing out from it, or an overgrowth of the turbinate bones in the nose and of the membrane covering them. If these conditions be rectified by cauterising, or by other forms of operation, and the patient given a good airway, the chronic catarrh will generally be found to disappear. In some instances there is no such anatomical peculiarities within the nose, and in these it may be advisable to have a bacteriological examination made of the secretion, and a vaccine made from the germ which is found to be responsible for the chronic catarrh. Injections with this will be found to effect a cure in not a few instances. In practically all cases the use of antiseptic lotions within the nose will be found of advantage. In those of milder degree these alone may be sufficient; in severer instances they should be employed in addition to some one or other of the measures already referred to. The following simple lotion will be found a very satisfactory one:

℞ Carbolic acid	. . . . . .	48 grains
Bicarbonate of soda	. . . .	192 grains
Water	. . . .	6 ounces

Dissolve. Make a lotion.

Take a teaspoonful of this, dilute with seven teaspoonfuls of warm water, and use night and morning. It may be either sniffed up into the nose from the palm of the hand, or sprayed in with a strong, coarse spray. Either of these methods is preferable to douching.

In the case of persons constantly working or living in an overheated, dry atmosphere there is a form of chronic rhinitis, characterised not by constant running at the nose, but by a feeling of excessive dryness within the nose. Dust, &c., tends to collect on the dried surfaces, giving rise to a feeling of intense irritation, and the habit of introducing the finger nail to scratch this is often formed. Bleeding and ulceration may follow from this. The proper treatment here consists in some form of application which will prevent undue drying. The dilute yellow oxide of mercury ointment may be smeared over the opening of the nostrils, and internally an oily spray should be employed several times a day, such as parolein containing 20 drops of pinol to the ounce.

A special form of chronic rhinitis is that known as *ozœna*, which is characterised by the extensive formation of crusts within the nostrils, and the production of a very disagreeable penetrating odour, which has been described as a concentrated essence of the smell of the great unwashed. The patient himself—or, more often, herself, for this disease is much commoner in women than in men—does not perceive the odour, for the sense of smell is lost, but the friends are usually very uncomfortably aware of it. The cause of this condition is not definitely known; there is frequently a long history of previous chronic catarrh of the nose, but definite ozœna is not commonly met with until puberty is well passed. Two or three members of a family may be affected, and it is not improbable that the disease can be communicated from one person to another. It is, however, scarcely ever met with except in people with wide, roomy nostrils. In older life, even when the condition goes untreated, it tends to wear off; but, on the other hand, persons with the condition are more liable than others to acquire consumption or some other form of lung disease. A permanent cure is only likely to be obtained if treatment is begun before the condition has become advanced; but in all cases great benefit can be obtained by preventing the crusts forming and collecting, and life is made bearable for the patient, and also, which is not unimportant, for the friends. The nose should be thoroughly syringed two or three times a day with a considerable quantity of hot water containing a little common salt, by means of a rubber Higginson syringe, followed by a few ounces of the carbolic and bicarbonate of soda lotion given above on this page. No pain is caused by this forcible syringing, because the lining membrane of the nose in this condition is comparatively insensitive. If any difficulty is experienced at first in getting the crusts out, they may be further softened before commencing syringing by introducing into each nostril a pledget of cotton-wool soaked in some oil—olive oil or colza oil will do equally well. During the day in the earlier part of the treatment, and at night for a considerable period, it is advisable to keep a plug of cotton-wool lightly inserted in the nostrils, so as to prevent the crusts from becoming too dry and hard. Treatment will, in all cases, have to be persevered with for a long time, although after a while it does not require to be done so often.

Polypi are growths in the nose of a jelly-like consistence, and usually hanging by a more or less definite stalk. They are not real tumour growths, but result from chronic inflammation of the mucous membrane covering the turbinate bones in the nose, or chronic irritation of this membrane from pus coming out of some one or other of the various air cavities opening off the nose. They give rise to obstruction of breathing through the nose on one, or more commonly on both, sides, and sometimes to a feeling of something flapping inside the nose with respiration. There is generally a thin, watery discharge, sometimes blood-stained. The patient cannot blow the nose properly, and the articulation becomes nasal in character. A definite diagnosis can only be made by having the interior of the nose examined. The treatment consists in removal of the polypi by wire snares, cauterising, &c. There is often a tendency for the polypi to return, and parts of the underlying bone, which is generally diseased also, are now commonly removed at the same time, a proceeding which will generally prevent any recurrence.

Cancer and other forms of malignant growths do occur in the nose, but are very rare. In late stages they cause great destruction of the nose and surrounding structures; in the early stages the symptoms are simply those of obstruction, and the diagnosis can only be made by a microscopic examination of a portion of the growth.

Epistaxis, or *bleeding from the nose*, is discussed under Epistaxis.

Foreign bodies are sometimes pushed into the nose by children, and their presence should always be suspected if a discharge appears on one side of the nose only, especially if it be blood-stained. The nose may be wonderfully tolerant of foreign bodies, and there may be little pain complained of, even from a structure of considerable size, and only the persistent discharge causes one to suspect anything of the kind. Unskilled attempts are better not made to remove such a foreign body, even when just inserted, unless it be lying quite free in the front part of the floor of the nose. The removal is very often best conducted under a general anæsthetic, owing to the risk of struggling and worse damage being inflicted if the attempt is made without one.

Suppuration in the Sinuses or Accessory Cavities of the Nose.—In the bones around the nose are a number of cavities containing air, and communicating by narrow openings with the interior of the nose. These cavities are lined by a membrane continuous with the mucous membrane of the nose, and this may be the seat of acute or chronic in flammations, like those of the nose itself. In acute inflammations such as a common cold in the head these cavities probably frequently share in the process, the heavy feeling felt behind the eyebrows, for instance, evidencing a catarrh in the frontal sinuses. This condition may become chronic, with a more or less constant discharge of pus into the nose, or, if the free discharge into the nose be blocked, a feeling of heaviness and oppression about the root and back of the nose. A definite diagnosis can usually only be made by examination of the nose, and tracing of the pus to its origin, and the treatment consists in the establishment of free drainage and of washing out these cavities, a proceeding which the patient cannot carry out himself. In the case of the cavities lying above the level of the nose, chronic suppuration is not very common, because these cavities can usually drain freely enough downwards into the nose, and the inflammation soon passes off. In the case of the largest of these accessory cavities, the *antrum of Highmore*, situated in the upper jaw-bone, the condition is otherwise, as its opening into the nose is situated almost at its highest part, and the drainage out of it is very imperfect. Suppuration in this is pretty common after any severe cold in the head, and especially after an influenzal one. It may also occur in connection with abscesses about the roots of the upper teeth, which come into very close relationship with the floor of this cavity. The symptoms are by no means always very severe, and patients may easily allow the condition to run on for years, suffering only from more or less constant discharge from one nostril, a sense of heaviness on one side of the head, and often rather a disagreeable odour coming from the affected nostril. If, after a bad cold in the head, a person complains of still feeling seedy and unable to throw off the cold on one side, this condition may be suspected as likely to be present. If, within the first three or four weeks, treatment is carried out thoroughly for a couple of days, a cure can almost always be obtained. The treatment consists in inhaling, for five minutes every hour, the vapour of a few crystals of menthol placed in a jug of hot water. Then lie down, with the shoulders raised on a pillow and the head low, lying right over on the side, always being on the side opposite that affected. This position puts the opening of the cavity as low as possible, and permits of free drainage, and, as mentioned, two days of this treatment will almost always bring about cure. In cases which have been allowed to run on indefinitely the general health generally suffers considerably, the patient becoming sallow, dyspeptic, and generally out of sorts. In these cases an opening into the cavity will have to be made somewhere or other. It may be through the socket of a tooth, or between the gum and the upper lip, and by frequent syringing through this opening the suppuration can be stopped, when the artificial opening may be allowed to close up.

Nostalgia.—The term applied to an aggravated form of home-sickness, which may amount to actual melancholia.

Numbness, or loss of sensation in any part, if not due to temporary causes such as coldness or pressure, indicates some disease of the nervous system, either of the nerves, or centrally of the spinal cord or brain. Lesser degrees often pass unnoticed until specially tested for. (See NERVOUS DISEASES.)

Nystagmus is the term applied to involuntary jerky movements of the eyeballs. These may be in an up-and-down direction or rotatory, but most commonly they are from side to side, and are generally most marked when the person turns the eyes to one side, the eyes then tending to jerk back to the midway position. The condition may be due, in children especially, to opacities on the cornea or clear part in the front of the eye, or to other eye diseases, or it may be a symptom of one of several diseases of the nervous system. A special variety of it occurs in people who work in the dark, especially in miners. This variety is probably analogous to writer's cramp, being due to constant overstrain of the eye muscles in endeavouring to fix the eyes when regarding objects in an insufficient light. There is no very good treatment for the condition.

Obesity.—In obesity, or adiposity, there is an increase of fat in those parts where fat is normally present, especially under the skin, and in advanced forms it is also deposited in places where there is usually none.

Fat persons may be divided into three classes: Firstly, those in whom the condition is an inherited tendency. They may never be heavy eaters, and may be constantly going without foods of which they are fond, but in spite of all they continue to put on weight. In the second, and probably the largest class, the condition is simply due to overeating and lack of exercise, although many of these individuals would probably deeply resent being told that they over-eat themselves, and will cheerfully go through all sorts of cures for obesity and take all kinds of anti-fat medicines, but will not do the one essential thing, and get at the root of the trouble by eating less. In a small third class obesity is due to actual disease.

Little need be said of the symptoms, as the diagnosis is obvious. There is generally shortness of breath, because of the greater difficulty experienced by the heart and lungs in supplying the needs of the heavier body. In advanced cases this is increased by the large deposit of fat around the heart, the one condition which may make obesity dangerous. The mental processes are sometimes slow and heavy, but by no means always. There is often constipation, and sometimes indigestion, but in others the digestion is all too good.

Treatment.—Obesity is pre-eminently a condition which it is easier and better to prevent than to cure. In the case of those in whom the tendency to obesity is their natural habit of body, this is even more so than in the others. For them to keep thin is almost an impossibility, and probably undesirable; they can only hope to remain not more than plump, and that only by following strict dietetic rules, such as are advised below. Where obesity is due to over-eating and lack of sufficient exercise, the mode of prevention is obvious, if there is only sufficient desire and strength of will to carry it out. The great majority of people certainly eat more than is necessary to maintain the body in good health and full working vigour; in many this excess can be taken with impunity (so far as obesity is concerned), but in others the excess runs to fat very easily. In such persons, to keep from becoming fat it is essential that they eat less. If the habit of eating well but not wisely has been acquired, this is by no means easily done; it requires no little strength of mind and perseverance, and at first is sure to be accompanied by some discomfort and a feeling of weakness, emptiness, and even faintness from the unwonted lack of food. The amount eaten very soon becomes a habit, however, and after a very short time the bodily feelings will become adjusted to the lessened régime, and there will not only be no discomfort, but a gain in comfort from the lessened accumulation of fat. It is wise for parents to see, as far as they can, that the habit of over-eating is not learnt in childhood; children and young people should certainly be plump up to the age of eighteen or thereabouts, but after that age it is not always right for "a good healthy appetite" to be indulged too freely.

To prevent obesity, the following regimen should be followed more or less closely, according to the individual tendency and degree of obesity present. Cut down, or cut out altogether, all fat and fatty meats and fish, such as duck, pork, salmon, mackerel, &c.; sugar, sweet preserves, farinaceous puddings, potatoes, peas, beans, butter, milk, and cream. All alcoholic drinks should be avoided, since alcohol has to be oxidised in the body, and so prevents the oxidation of the foodstuffs and tissues; and even water should be drunk in moderation, and not at all during meals. Lean meats and fish may be taken, but no rich sauces with them, green vegetables freely, tomatoes and fresh fruits in moderation, dry toast and plain hard biscuit, a little tea or black coffee without sugar at tea-time and breakfast. Exercise must be taken regularly and daily to the degree of moderate fatigue. It is worse than useless to indulge in it to excess, and then follow it up by a heavy meal and a long lazy loll. The bowels should be kept freely open, preferably by the use of any one of the common aperient mineral waters, one or two wineglassfuls being taken with a little hot water before breakfast, or by a tablespoonful of sulphate of soda dissolved in half a tumblerful of warm water and taken similarly.

If living on such a régime does not prevent increase in weight, a still more rigid diet—on the same lines, but less in amount—must be followed, one which causes privation and leaves the patient actually hungry. It is generally advisable, before going to such extreme measures, to get medically examined, and see to what degree such measures can be safely carried out; in many instances it is scarcely possible to carry them out anything like satisfactorily except under supervision in a sanatorium. This will apply especially to any one over forty who is desirous of getting thin. In the case of women it is seldom desirable to get thin too rapidly; in those with plump tendencies they will be well advised to be content with being plump, and not try to get actually thin. Plump and fat persons have this advantage over their skinnier neighbours, that they are generally happier and without neurotic tendencies. If they deliberately make themselves thin they lose fat not only from the parts where it can be spared, such as the hips and waist, but also from the face, chest, and around the internal organs. The result is that the face becomes wrinkled, the chest flat, and internally there is apt to develop floating kidney, dropped stomach, displacements of the womb, &c., and the woman's life is rendered a misery.

With regard to drugs in the prevention or cure of obesity, there is only one substance which has at all a certain influence in reducing flesh, and that is thyroid gland. Even this does not always act, and it seldom has very much effect unless given in doses which are sufficiently large to cause distinct heart weakness; so that it must be taken with caution, and should not be used rashly by any one going about, but only under medical supervision and in bed. Of the many and much-advertised remedies some contain this substance; others consist chiefly of an extract of bladderwrack, a kind of seaweed, or some preparation of citric or other acid. These act mainly, if not entirely, by upsetting the digestion, which is certainly one way of lessening the intake of food, but not a very rational method. We would give a special word of warning against those preparations which promise a rapid reduction in flesh; if they do cause this, it will only be at the expense of a wrinkled skin where the fat has disappeared, so that the figure may be rendered sylph-like indeed, but the patient will be more like a hag than a well-preserved woman.

Of the forms of obesity due to disease, we need only mention that form known as *adiposis dolorosa*, in which there are masses of fat deposited in various parts of the body, but not all over it, and these formations of fat are accompanied by neuralgic pains of varying severity. The forms of obesity due to some definite disease are really very rare, and do not require special description as to treatment.

Obstruction of the Bowels.—See under Intestines, Diseases of the.

Occupation Neuroses and Diseases.—See under Cramp (*Writer's, &c.*), also Trade Diseases.

Œdema means dropsical swelling or dropsy. When it appears first in the feet, it generally indicates heart disease or weakness of the circulation; under the eyes, Bright's disease; in the abdomen, some obstruction about the liver. (See Dropsy.) Œdema may also occur in the internal organs—as, for instance, in the lungs—usually along with congestion (see Lungs, Diseases of the), or in the larynx. (See Throat, Diseases of the.) A special form may occur in localised patches on any part of the body, but perhaps specially about the face—for instance, round the mouth—lasting only quite a short time, and coming and going without any very obvious reason. This form only occurs in persons of a nervous temperament, and sometimes runs in the family. In appearance the patch looks like a large spot of nettle-rash. The cause is unknown, and there is no special treatment beyond improving the person's general state of health.

Œsophagus or Gullet, Diseases of the.—See Throat, Diseases of the.

Onychia means inflammation of the nails.—See Nails, Diseases of the.

Ophthalmia means inflammation of the eye, or it may be limited to inflammation affecting the front of the eyeball and inner surface of the lids—*i.e.* conjunctivitis. (See *Conjunctivitis,* under EYE, DISEASES OF THE.)

Orchitis means inflammation of the testicle.—See under SCROTUM and TESTICLES, DISEASES OF THE.

Oriental Sore, also known as Oriental boil, Delhi boil, and Aleppo button, is the name given to a disease of tropical climates, in which a chronic ulcer forms on some part of the skin. It begins as a small pimple, spreads, breaks down into an ulcer, and heals very slowly, generally taking from six months to a couple of years, and often leaving a very unsightly scar. The names indicate roughly the geographical distribution of the disease; in India its headquarters seem to be the district between Bombay and the mouth of the Indus. The cause of the disease is now known to be a parasite of the same type as that which causes Kala-azar or Dum-dum fever. One attack of Oriental sore usually gives lifelong protection against any subsequent attack. The usual treatment is simply to apply ordinary antiseptic dressings, much the same as to any ordinary simple ulcer; but in many parts of India all remedies, both internal and external, have lost repute to such an extent that persons afflicted take the disease as a matter of course, and wait for Nature to heal the condition in her own time. Since the discovery of the causative organism, and the possibility of cultivating it artificially, successful results have been obtained by injecting patients with "vaccines" or sterilised emulsions of the artificially grown organisms, and there seems every prospect that in the near future this will be the routine method of treatment—easy, rapid, and permanent.

Osteitis (inflammation of the bone), *Osteomalacia* (softening of the bone), and *Osteomyelitis* (inflammation in the marrow of the bone).—See under BONE, DISEASES OF THE.

Otitis means inflammation of the ear.—See EAR, DISEASES OF THE.

Ovaries, Diseases of the.—See under WOMEN, DISEASES PECULIAR TO.

Ozœna.—See under NOSE, DISEASES OF THE.

Pain.—This is, without doubt, the symptom which most frequently indicates the presence of illness or disease, and for which relief is most frequently sought. The ability to perceive pain is a special sense which has evolved, or with which the body has been endowed, in order that it may be protected from the conditions which do damage, and in so doing produce pain. There are special nerve-endings in the skin and elsewhere, and special nerve fibres, for the conduction of the stimuli which, when perceived in consciousness, we call pain. The sensibility to pain varies greatly. Certain races are, as a whole, much more sensitive than others, but the individual variations are more important practically. High-strung, neurotic individuals will complain bitterly of pain from a cause which, in a person of a more phlegmatic type, will give rise merely to discomfort, although in both instances the sensations are equally real. The mode of life may modify considerably the pain sensibility—habitual endurance of hardship, for instance—blunting it markedly. Strong mental prepossessions may even temporarily prevent the perception of pain altogether, whilst apprehension invariably increases pain, and may even originate it. Such facts as these must therefore be taken into consideration when estimating the amount of pain from which an individual is suffering, and attempting to make a diagnosis of the condition which is giving rise to the pain. Another point to be considered is the individual manner of statement. Some patients, as a matter of pride, understate their sensations, whilst others, without any intent to deceive, habitually magnify their sufferings. The expression and bodily attitude of the patient are, in this connection, often of more value than their mere statements, especially in the case of hysterical patients, who will sometimes tell one with a cheerful countenance that they are suffering at that very moment from terrible agonies. When really severe pain is being felt, the patient's face is often drawn, and the skin perspiring, the pulse small and wiry, the respirations rapid, and the pupils dilated.

Pain varies much in character, and the nature of the pain is often a valuable aid in diagnosis; but it is a very difficult matter either to give or to get a very lucid description of a pain, the terminology varying so much with the individual and his sensitiveness. Acute pain is fairly characteristic of acute inflammations, especially of joints or in one of the cavities of the body, whilst, if acute and radiating, it points rather to neuralgia or neuritis. Dull pain is found along with more chronic inflammations, and also in acuter affections of mucous membranes and internal organs, which are much less endowed with pain-perceiving nerves than the skin. Pain which comes and goes may be neuralgic, and it is also typical of colics. Gnawing or boring pain is encountered chiefly in diseases of the spine and of bones generally, also in cancer of the stomach. Cramp is a painful spasm of muscles, affecting not only the ordinary skeletal muscles, but also those of the walls of the internal organs (abdominal cramps, gripes, or colics). Pain may also be described as burning, aching, or throbbing, the latter variety being most common about an abscess. Movement, as a general rule, intensifies pain, but firm, steady pressure relieves some varieties of it.

The seat of pain generally corresponds with and lies over the position of the affection which is causing it, and the location is therefore of the greatest aid in diagnosis; but this is not invariably the case. If pain is very intense, the pain may be felt over a large area surrounding the actual site of disease, and, even without being very severe, it may be felt at parts far removed from the cause. This curious phenomenon is often explicable by the fact that the two parts—the site of the disease and the seat of the pain—are supplied by branches of the same nerve, and there is a false referring in the brain of the place from which the painful stimuli are coming. Thus, the pain of hip-joint disease is frequently felt in the knee, and another well-recognised "referred pain" is that felt in the breasts from disease of the womb.

General pain, or aching all over the body, is met with in most fevers, especially in their early stages, influenza and smallpox being two fevers with this feature very pronounced, as also is such a seemingly slight affection as acute tonsilitis. The various causes of headache and backache are discussed under these individual headings, and the chief causes of pain in other parts of the body will be best gathered from the accompanying charts.

Tenderness, or pain on pressure, is usually present over the seat of spontaneous pain, but not invariably, as either one or the other may be present separately. In the case of the internal organs, especially those in the abdomen, the pain felt on pressure is largely of the nature of a referred pain in the skin over these organs, as is shown by the fact that the skin is exquisitely tender, even when pinched up and pressed in such a way that there is no pressure directly on the affected organ underneath.

The treatment of pain is dealt with more fully under the individual complaints. We need only mention here that the general principles on which the treatment is based are as follows: (1) Removal of the cause, if that be possible, such as by opening an abscess and letting out the matter, thus relieving the tension, or by pulling a decayed tooth, &c.; (2) soothing the nerves of the painful part by various means, especially by moist heat in the form of a poultice or hot fomentation; (3) blocking the conduction of the pain stimuli through the nerves by the use of such drugs as bromides, cocaine, &c., by electricity, or in extreme cases, by division of the nerves; (4) diminishing or dulling the sensitiveness of the pain-receiving parts of the brain by drugs such as opium or morphia, phenacetin, chloroform, &c., or the inhibition of pain sensation by more powerful mental impressions, such as by suggestion or hypnotism.

Painter's Colic.—See LEAD-POISONING.

Palate, Affections of the.—See MOUTH, DISEASES OF THE.

Cleft Palate.—See under DEFORMITIES.

Palpitation.—This means consciousness of the heart's action. As a general rule we are quite unconscious of the beating of the heart, unless on severe exertion, but any excitement of the nervous system may make its action unpleasantly palpable. The cause may be purely nervous, as in hysteria, or from any great excitement, and it is commonly experienced about the time of puberty, and in delicate girls at the menstrual periods. It is very common in neurasthenia, and is one of the cardinal symptoms of exophthalmic goitre. Other causes are anæmia, over-indulgence in tea, tobacco, or alcohol; and the upward pressure on the heart of a stomach distended by flatulence is probably one of the commonest of all sources. It is also present in some forms of heart disease or fatty heart, but is not nearly of such serious significance with regard to the state of the heart as is often feared by persons with palpitation. In gouty subjects there is often an irregular palpitating action of the heart, of no great importance. The treatment should be essentially directed towards the condition which is responsible for the palpitation. If the condition itself is very disagreeable, one of the best measures to relieve it is to lie down and have an ice-bag applied over the heart. This may be kept there practically indefinitely. A few drops of peppermint water, essence of ginger, or sal volatile are often of great benefit, especially in cases where there is flatulent distension.

Palsy.—See PARALYSIS.

Pancreas, Diseases of the.—The pancreas or sweetbread is an organ which is not subject to a great many diseases. It also lies so deeply in the abdomen that it is difficult to feel, and its secretions are not readily obtainable for examination. For these reasons diseases of the pancreas are not likely to be readily diagnosed, and may be dismissed very briefly.

Acute inflammation of the pancreas, or pancreatitis, may occur, the symptoms being sudden onset of violent pain in the upper part of the abdomen, followed by vomiting and collapse, and, if not quickly relieved, it is rapidly fatal. The symptoms are not very distinctive, and may readily be mistaken for those of obstruction of the bowels, peritonitis, &c., and a definite diagnosis sometimes cannot be made until the abdomen is opened. If, however, the necessity of operation is recognised, this does not matter very much, as in all these cases the one hope, practically speaking, of recovery lies in operative treatment. Until the time of the operation the pain may be relieved by hot fomentations or poultices on the abdomen.

The pancreas may be the site of tumours or cysts, giving rise probably to a definite lump or swelling in the upper part of the abdomen. The head of the pancreas may also be the site of a cancer, in which case there will generally be a lump, which can be felt, just a little above the navel, and there is usually an early development of jaundice. Operation is again the only hope, but even this does not hold out great prospects.

Diabetes may be due to pancreatic disease.

Pappataci Fever.—See THREE-DAYS' FEVER.

Paralysis.—Paralysis means partial or complete loss of voluntary muscular power in some part of the body, although the term *paresis* is sometimes used for a partial paralysis where the power is not completely lost. There are certain other terms used in speaking of paralysis which it will be convenient to define here, as it will save unnecessary repetition in the further description. *Hemiplegia* means paralysis of the whole of one side of the body, including the arm and leg, and is always due to disease on the opposite side of the brain. A rare form is *crossed hemiplegia*, which means paralysis of the leg and arm on one side of the body, with paralysis of the muscles of the face or of the eye on the opposite side. This is due to disease low down in the brain, about the portion known as the pons variolii. *Diplegia* means more or less complete paralysis of both sides of the body and all four limbs; it may be due to injuries received during birth, or to the disease known as infantile paralysis. (See below.) *Paraplegia* means paralysis of both lower extremities, and possibly of the lower part of the trunk; it is due to some affection of the lower part of the spinal cord. *Monoplegia* means paralysis of one extremity. Still more localised paralyses may occur, individual muscles or groups of muscles; these may be due to affections of the nerve trunks, or to localised disease in the spinal cord.

General paralysis is the term applied to a definite disease, in which paralysis comes on not only of muscles, but of all the bodily functions, including the mental powers. (See under INSANITY.) *Infantile paralysis* is a form of paralysis which comes as the result of an acute feverish illness, which occurs chiefly in children, but also sometimes in adults.

This is specially described below. *Shaking paralysis*, or the shaking palsy, is a popular name for *paralysis agitans*, which is also described separately. *Creeping paralysis* is a rather vague term, which may be used for any form of paralysis which is getting gradually worse; it is not uncommonly used in connection with locomotor ataxia, in which there is, as a rule, no real paralysis or weakness of muscles, but only an inability to control the movements properly. (See Locomotor Ataxia.)

Paralysis is really a symptom of disease or destruction of some part of the nervous system, and not a disease in itself. Since it may come on from affections of any part of the nervous system, and as the paralysis has certain peculiarities, depending upon the site of the affection, it will be simplest to divide the different forms of paralysis into those resulting from disease affecting the brain, the spinal cord, and the nerves respectively. It must also not be forgotten that great weakness, amounting in advanced stages to actual paralysis, may occasionally result from diseases affecting the muscles themselves. (See Muscles, Diseases of the.)

Paralysis resulting from Brain Affections.—The commonest form of paralysis here is a hemiplegia, and the cause is usually an apoplectic stroke. (See Brain, Diseases of the.) This form of paralysis comes on suddenly, generally in elderly people. The hemiplegia is not always a complete one, and in persons who recover from the immediate effects of the stroke there may be a considerable recovery of power. The face usually recovers first, then the leg, whilst in the arm recovery is usually most delayed and less complete. One great characteristic of palsies of this type is that the paralysed parts tend to become stiff and rigid, and contractures may develop, but there is very little wasting of the paralysed muscles. The gait of a hemiplegic person is characteristic also. (See Gait, Disturbance of.) Paralysis may develop slowly as a result of a brain tumour, and in this instance the distribution of the paralysis may be much more limited, and there may be epileptic-like spasms commencing in, and spreading from, the affected part. In children paralysis may be present as a result of injury or disease coming on at or soon after the time of birth. This may be either a hemiplegia or a diplegia; in both instances the paralysed limbs are stiff, in the latter the legs often cross each other like a pair of scissors. Many of these children are mentally defective or epileptic. Blows or injuries to the head may also cause paralysis, as the result of compression by a depressed fragment of bone or the pressure of a blood clot on the surface of the brain.

Treatment.—The general treatment applicable in cases of apoplexy is described under that heading. For the hemiplegic paralysis nothing should be done until about a month after the stroke; then measures should be commenced which have for their object the keeping up of the nutrition of the paralysed muscles, the return of strength into them, and the prevention of contractures. Too much cannot be expected, and some paralysis will probably always remain; but, on the other hand, there is too often too much of a *laisser faire* policy adopted, in the belief that nothing can really be done of any service. This is far from being the case. The use of electricity, and, above all, of massage and passive movements of the paralysed limbs, will materially help to bring back power; and, even in the worst cases, where this may not be possible, their use will prevent the formation of contractures, which, if allowed to form, may be very troublesome and add considerably to the patient's discomfort. The patient's friends can usually be taught to carry out the treatment themselves if shown at first by some one skilled in such work, and, by persevering, much more can be done to help the condition than often is done, simply on account of the false belief that it is of no use doing anything. In the case of an infant receiving injuries during birth, if the condition is recognised at the time, surgical operation has been effective in some instances in preventing any ill effects following. If the condition is due to disease of the brain rather than to injury, the outlook is much less favourable. Operation is then of no use, and for the paralysis little can be done, although by careful training the child may be prevented from growing up as an imbecile altogether. In the case of paralysis from injuries and compression, trephining and removal of the depressed bone or blood-clot is indicated.

Paralysis agitans, or *shaking palsy*, is a disease whose cause is not known, but it is probably a brain affection. It is characterised by a peculiar tremor or shakiness, together with muscular weakness and rigidity. It seldom comes on before the age of forty, and commences very gradually and insidiously. The tremor is generally first seen in one hand, being a fine movement like pill-rolling between the thumb and forefinger. From there the movement may spread, until more or less the whole of the body may be shaking in bad cases, but in others it never spreads very much. The head, if affected, usually nods, in contrast to the shaking movements seen in simple senile weakness. The movements are at first under control, and can be stopped by an effort of will, but in bad cases the power to stop them may be quite lost. They stop during sleep, but in bad cases, again, they may be so severe as to prevent sleep. Loss of power gradually advances with the tremor; if the shaking does not get worse, neither does the weakness. Associated with the weakness is rigidity, as evidenced by the slowness and stiffness of the movements. The head is usually bent forward and the shoulders rounded, and the elbows are kept constantly bent. The gait is very characteristic. (See under Gait.) The face is fixed, expressionless, and mask-like, and the speech slow and monotonous. The mental faculties are quite bright, and in marked contrast to the vacuous expression. The condition is a long-lasting one, patients living for years with this disease, but cure is rare. There is really no treatment known which has any direct curative effect, and it is only in those cases where the movements become so violent as to interfere with the patient's rest that it becomes necessary to give some sedative to lessen them. Hyoscine is one of the drugs with the most satisfactory results in this direction.

Paralysis due to Affections of the Spinal Cord.—In the case of paralysis resulting from disease affecting the spinal cord within the backbone, two of the chief characteristics are that there is always marked wasting of the muscles, and the paralysed parts are usually limp and flaccid, instead of being stiff and rigid, as in paralysis from brain affections. If only some of the muscles of a particular limb are paralysed, contractures may result from the unopposed action of the remaining healthy ones. As a rule, but not invariably, both sides of the body are affected. The cause of the disease may be in the spinal cord itself, or it may be in the spine, with resulting pressure on the cord. When the spine is affected, there is usually complete paralysis below the site of the injury or disease, not only of power of movement, but also of sensation, and the control of the bladder and bowels is interfered with. (See SPINE, DISEASES OF THE.) Of the diseases affecting the spinal cord itself, some come on quickly or even acutely, others slowly and gradually; some produce no other symptoms than paralysis and wasting of the muscles, others involve parts of the cord which result in loss or disturbances of sensation, interference with the control of the bladder, &c., just as in the case of injuries to the spine. One or two of these diseases require rather fuller description.

1. *Progressive muscular atrophy*, or *wasting palsy*, is a disease coming on usually in middle life, although sometimes earlier, and it practically always begins as a wasting of the muscles which form the prominence of the ball of the thumb, with loss of power there. The wasting and paralysis gradually but very slowly spreads from there to the muscles higher up the arms, and then affects those of the trunk and lower limbs. The cause of this disease is quite unknown; it may become arrested at any stage, or it may go on until the person becomes a walking skeleton (many of the "living skeletons" in shows are really sufferers from this disease), and dies ultimately from sheer weakness, or from bronchitis, or some slight affection of the lungs, which may easily be fatal owing to the weakness of the muscles of respiration.

2. *Infantile Paralysis, or Poliomyelitis.*—This is a form of paralysis which comes on as the result of an acute feverish illness. It is commonest in children and young persons, but adults may also be affected. It is a disease which may affect an isolated case here and there, but within the last few years there have been regular epidemics occurring in various parts of the world. These have been mostly in the summer time in temperate climates; so far it has not occurred in tropical climates. The disease is now known t be due to a living virus of some sort, but not one of the ordinary microbes; it can be communicated from human beings to certain animals, but how the infection is acquired by human beings is not yet known. There is sufficient evidence to show that it should be regarded as, at all events, slightly contagious, so that cases should be isolated, particularly from other children, during the acute stage of the illness. The disease begins much like any acute fever, with rise of temperature, sickness, headache, and aching in the back and limbs; then, within a day or two, the patient is more or less extensively paralysed. Sometimes there is very little preliminary illness, the paralysis being the first thing noticed. This is sometimes attributed to a fall (as in the historic case of Mephibosheth), but it is really much more likely that the fall is a first result of the weakness of the oncoming paralysis, and not its cause. The paralysis is always much more extensive at first than is ultimately the case. Sometimes the paralysis is so extensive that the patient dies in the acute stage from involvement of the respiratory muscles, but this is exceptional; more often it is only one or two limbs, or only part of one limb, that is affected. The acute symptoms pass off in about ten days or so, and then the paralysis begins to narrow down to that which will remain as a permanent result. The affected parts remain weak, limp, and flail-like, and, if in a young child, do not grow to the same extent as the unaffected side, so that one leg or one forearm may be smaller than the other. Contractures may follow, and club-foot is one of the most frequent results of infantile paralysis. There is practically never any other results of this acute inflammation in the grey matter of the spinal cord—no loss of sensation, for instance, nor any interference with the control of the bladder or bowels.

3. The disease known as *bulbar palsy* is practically the same disease as either progressive muscular atrophy or infantile paralysis, according as it takes an acute or a chronic form. But the highest part of the spinal cord and the medulla oblongata is the site affected in the nervous system, with the result that the muscles affected are those of the tongue, lips, and larynx. There is difficulty in swallowing and with speech, saliva trickles from the mouth, and the tongue wastes. This is a more serious affection, as, sooner or later, food or secretion find their way past the larynx down into the lungs and set up a form of broncho-pneumonia, with fatal results.

Treatment.—In a few cases of injury to the spine, and in a still fewer number of cases where the paralysis is due to an affection of the cord itself—*e.g.* tumours pressing on it—the paralysis can be cured by operation. In the majority of instances of spinal disease, or where the back is broken and the spinal cord completely divided or badly crushed, operation is of no avail, and but little can be done for the paralysis. What measures are necessary will be found under SPINE, DISEASES OF THE. In progressive muscular atrophy the treatment which has most effect in stopping the progress of the disease is the injection into the muscles regularly of small doses of strychnine, the amount and frequency being controlled by medical advice. In the case of infantile paralysis, we are so far unable to indicate any means whereby the attacks of this serious crippling disease may be avoided, as we are quite unaware of the means whereby the infection is spread. The contagiousness of the complaint is seemingly slight, but sufficient to warrant isolation of patients so soon as the nature of the illness is recognised, and particularly the removal of other children from close contact with the invalid until after the acute stage of the attack. There is some evidence that the secretions from the nose may harbour the infective agent, and they had better be collected and destroyed by burning. Practically nothing can be done during the acute stage to limit the amount of the paralysis, and active measures should not be started for ten days or so, until the fever has gone. Then comes the time when massage and rubbing of the muscles aid in the recovery of power, and the mother or nurse can be shown perfectly well how to carry out this treatment. The importance of it must be thoroughly realised, and the necessity of carrying it out continually and persistently for not less than a year after the attack, and perhaps even for longer, because it may be all that time before the full measure of recovery is attained. Another important point obtained by rubbing and gentle manipulation of the limb is the prevention of contractures and deformities. Electrical treatment is sometimes employed also, but is not so generally useful as massage. A year or two after the attack it will be advisable to have a consultation with a surgeon, to see whether any operation on the paralysed limb is advisable. This is especially the case if contractures have been allowed to form; but in all cases an opinion is worth having, because, in not a few instances, a certain amount of improvement can be brought about by nerve or tendon grafting, or, at the very worst, a useless flail-like limb may be made of some service by the production of a stiff joint.

In bulbar paralysis of the acute type little or nothing can be done to save the patient; in the chronic form great care in the feeding is the most essential point, to see that food does not get down "the wrong way" into the windpipe and lungs.

In many cases of spinal paralysis, where there are other symptoms besides paralysis, these may be of more importance from the point of view of treatment and the patient's comfort, especially the nursing, the prevention of bedsores, and the regular and careful attention to the functions of the bladder and bowels.

4. *Paralysis resulting from Affections of the Nerve Trunks.*—In paralysis of this type the distribution is usually a fairly limited one, a single muscle or a single group of muscles being all that is affected. Thus, in facial paralysis, one of the commonest examples, there is paralysis of one side of the face, but it is strictly limited to this area. Another common example is to find wrist-drop from paralysis of the group of muscles on the back of the forearm. In the condition known as multiple neuritis, and also in beri-beri, there is extensive paralysis from involvement of many nerve trunks. The onset may be sudden or gradual; the symptoms may be simply paralysis, or there may also be pain or loss of sensation, if the affected nerve or nerves contain sensory as well as motor fibres. In cases which last any length of time, changes in the appearance of the skin are frequently seen—*e.g.* the development of a peculiar, smooth, red, glossy appearance. The commonest cause is neuritis, resulting either from some poisonous substance circulating in the blood, such as alcohol, lead, or the toxins of some fevers, or, it may be, from pressure on the nerve trunk by a tumour, an abscess, the end of a broken bone, or, from the exterior, by a splint, a crutch, the back of a chair, &c. (See under Nerves, Diseases of.) The prospects of recovery in this form of paralysis are, as a general rule, very good. It is, of course, necessary that any pressure on a nerve trunk should be relieved, and that the intake of any poisonous substance should be stopped. Beyond these points the regulated use of massage is again one of the most generally applicable means of bringing back life into the weakened muscles, although electricity has also a considerable field of value here—more so, probably, than in any of the other forms of paralysis. Various nerve tonics may also be useful, but the recommendation of these is only advisable with full knowledge of the circumstances of the case.

Paraplegia.—See under Paralysis.

Parasites, Diseases due to Animal.—The number of diseases due to parasites living in or on the body might be multiplied almost indefinitely, if one were to include all the conditions due to vegetable parasites, seeing that microbes or bacteria belong to the lowest class of the vegetable kingdom, and minute fungi are also responsible for a few conditions (thrush, actinomycosis, &c.). We do not propose to include those here, not yet the diseases caused by microscopic animal parasites, such as dysentery, malaria, and sleeping sickness. The visible parasites which from time to time make man their temporary or permanent host are fairly numerous. They fall into two main groups—external parasites, chiefly insects; and internal parasites, belonging mainly to the group of worms. The following are the commoner forms, with the symptoms caused by them:

1. *External Parasites.*—*Bed-bugs* are only temporary parasites, which emerge from their habitat in dirty bedclothes, crevices in wooden bedsteads, and walls of huts and houses, to suck blood through the skin. Apart from the discomfort of their bites they are of importance, because it has been demonstrated that the germs of certain diseases, such as kala-azar (*q.v.*), are spread mainly, if not entirely, through the bite of the bed-bug. If travelling in bug-infected districts, the only certain method of avoiding them is to keep clear of the native huts. The use of powders, such as Keating's, sprinkled about the bed, cannot be relied upon to scare them off. Fumigating infected rooms, bedding, furniture, &c., with sulphur, or spraying with corrosive sublimate lotion, may get rid of many of them, but the only effective method of destroying them is to burn down the huts.

Fleas are also only temporary parasites on man, but make up for their temporariness by being practically world-wide in their distribution, and very easily picked up by coming into the near neighbourhood of an animal or human being on whom they are, or by sleeping in strange beds whose previous occupants have not been above suspicion. Fleas may be warded off by sprinkling sheets, &c., with Keating's powder; but when they get about one's body, probably the best plan is to sprinkle a few drops of chloroform here and there over one's underclothing. The flea has assumed a new terror since the recent but completely authenticated proof that the bacillus of plague is spread from animal to animal, and from animals (especially rats) to man, through the medium of fleabites.

Flies.—Certain species of flies in warm countries may lay their eggs in the noses or ears of persons sleeping in the open, or in wounds in the skin. The eggs soon hatch out into maggots, and these, by their boring action, may give rise to considerable discomfort, or may even be fatal by boring into the brain. The best treatment consists in having the nose or ear explored by a good light, and each egg or larva touched with a probe carrying a little cotton-wool soaked in pure chloroform, which soon kills the insects, and they may then be picked out with forceps. Short of this, syringing with fairly strong carbolic lotion (1 in 40) may be of value in getting rid of them, and, in wounds, washing with carbolic lotion is almost always sufficient. Flies—or rather their larvæ, maggots—may also gain entrance into the intestines, the eggs being swallowed in fly-blown food. Here they are comparatively harmless, although the appearance of numerous crawling maggots in the stools gives rise to considerable alarm. There are usually no symptoms, but there may be vomiting, pain in the abdomen, and diarrhœa. The treatment consists in free purgation, calomel being the best purgative for the purpose. Several 1-grain blue pills may be taken, with an hour interval between each. Flies must also be looked upon as active agents in the spread of many bacterial diseases, carrying the germs from infected material, and readily infecting food, &c.

Lice, or *pediculi*, are of several species, and may take up their habitation on any of the hairy parts of the body or in the underclothing. The infection is generally obtained by wearing the cap of some person who has them in his hair, from strange beds, or from the seats of public water-closets. They give rise to great itchiness and scratching, and, in the case of the scalp, if present for long, the glands at the back of the ears may become enlarged, the scalp itself one mass of eczema, and the hair filthy and matted. The simplest and most certain mode of treatment is to soak the hair well in ordinary paraffin oil, and to keep a piece of cloth soaked in the oil in contact with the head or affected part of the body all night for three nights running. In the case of the head, a bathing cap will be found most suitable for this purpose. For "crabs" amongst the hairs of the private parts the same plan may be employed, using a pair of bathing drawers, or blue ointment may be smeared on in places like the armpits if they are affected. This plan not only kills all the grown lice, but destroys their nits or eggs attached to the hairs. A good wash with warm water and soap will get rid of the paraffin. The underclothing may be rendered safe by heating in the oven.

The itch is due to a parasitic mite or acarus. (See Itch.)

Jiggers, chiggers, chigoes, or *sand-fleas* are minute fleas which live in sandy soils in many tropical regions, and the impregnated female has a habit of burrowing under the skin of the feet of both man and animals. Less commonly they may also lodge in other parts of the body. The bite causes little pain. The female is usually detected when she commences to enlarge under the skin; there is then intolerable itching, with the formation of a swelling about the size of a large pea. Abscesses and ulcers may form with discharge of the eggs and insect if they are left alone; if the jiggers are numerous, extensive unhealthy sores may form. The treatment consists in picking out the jigger with a needle whenever its presence is recognised. The inhabitants of infested regions become very expert at this, and they usually have a regular evening inspection of their feet. Wearing boots prevents the feet becoming infected, and smearing the bare feet or hands with eucalyptus oil also acts as a preventative against the bite of the insects.

Maggots.—See above, under *Flies.*

2. *Internal Parasites.*—With the exception of maggots referred to above, these consist almost entirely of various members of the worm family. These may be conveniently divided into round worms, flat worms, and tape-worms.

(*a*) *Round Worms.*—One of the commonest of these is the small worm known as the *thread-worm* or *Oxyuris vermicularis.* This is found in many countries, but it is almost always children who are infested by them. The worms are from a quarter to three-quarters of an inch in length, and look like small pieces of white thread. They can often be seen in large numbers in the stools, wriggling about for some time after their exit from the body. They often wriggle out of the anus, causing intense itching. Other symptoms which may be caused by them are picking of the nose (although this is not by any means proof positive of the presence of worms, as is sometimes supposed), colicky abdominal pains, grinding of the teeth and restlessness during sleep, and sometimes even convulsions. The appetite may be voracious, or it may be quite unaffected. To get rid of them is, fortunately, comparatively easy. The child should first be given some ordinary purgative, so as to empty the bowels; several repeated injections of strong salt and water or infusion of quassia chips should then be given, each injection being about a pint in quantity. Internally, the same night, a 2-grain santonin powder should be given. This will usually completely get rid of them.

Ascaris lumbricoides, or the *round worm*, as it is sometimes called. This is also a common parasite in many lands, but especially in warm countries. This worm looks like a reddish earthworm, and may be from 4 to 12 inches in length, pointed at both ends. There may be only one present, or as many as a dozen or more. The symptoms are very much the same as those caused by the presence of thread-worms, but their presence can only be definitely recognised by one of the worms being passed in the motions, or, more commonly, by a microscopic examination of the stools, and the finding of the eggs of the worm, which are usually present there in large numbers. The treatment consists in starvation for eighteen to twenty-four hours, then the administration of a santonin powder (from 2 to 5 grains, according to age). This drug has the peculiar action of making the person who takes it see everything yellow, so it is advisable always to give it at night. It stupefies the worms, and in the morning they should be swept out of the bowel by the administration of a good dose of castor oil. It is generally advisable to repeat the treatment a second time, after three days have elapsed.

The *hookworm*, or *Anchylostoma* (or *Uncinaria*) *duodenale*, so called because it inhabits chiefly the duodenum or first part of the small intestine. This is an exceedingly common parasite in most tropical and many sub-tropical countries, the disease it gives rise to being known as anchylostomiasis, or hookworm disease; also, from the anæmia which is one of the chief symptoms, as tropical chlorosis, miner's anæmia, tunnel disease, and Egyptian chlorosis. The last three names owe their origin to the facts that Egypt is a great stronghold of the disease, and because it is very apt to affect workers in the warm, moist air of tunnels and mines, and to lead to a severe form of anæmia. In the navvies working at the piercing of the St. Gothard tunnel it was especially baneful, and it has, within quite recent years, been introduced into the mines of Cornwall. The infection by the worm is due to the eggs being swallowed in drinking-water, or through the soil. The worms are from about one-third to one inch in length, and the mouth is provided with sharp hooks, by means of which they hang on to the interior of the gut. The chief symptom produced is a profound anæmia, with its concomitant symptoms, such as languor, breathlessness, increasing debility, and swelling of the feet and ankles. There is usually also dyspepsia, pain in the upper part of the abdomen, diarrhœa, and malæna, or black, tarry-looking stools, from the presence of altered blood in them. The blood often presents rather characteristic appearances on microscopic examination, but a positive diagnosis of the disease is most readily made by microscopic examination of the stools, the typical eggs of the worms being found there in abundance.

Prevention requires the exclusion of infected persons from earth workings, and defecation in mines or tunnels should be rigorously prohibited, or only allowed in special latrines. Care should also be taken to wash the hands free from soil before eating, to see that the water is boiled or filtered before drinking, and that the boots are sound, as it is possible for infection to take place through abrasions in the skin. The destruction of the worms in the body is best carried out by means of thymol. This drug requires to be given in doses sufficient to cause some collapse on the part of the patient, so that it should only be taken under medical supervision. From 20 to 30 grains of it in a cachet are given on an empty stomach; this is repeated in a couple of hours, and followed by a strong saline purge, such as Epsom salts. The thymol may require to be given again a few days later. The anæmia requires treatment by iron, on the same lines as ordinary chlorosis.

The whip-worm (*Tricocephalus dispar*) is another widely distributed parasite, France being one of the countries in which it is particularly common. This worm is 2 to 3 inches in length, one part being much thicker than the remainder, giving it the appearance of a whip and shaft. It lives in the large intestine. Very often it gives rise to no symptoms whatever, and treatment is really not often required. It may lead to diarrhœa, however; and again the diagnosis can only be confirmed by seeing the actual worms, or finding their eggs by microscopic examination of the stools. If necessary, thymol is the best drug to kill them, it being given in the same manner as for the hook-worm, but smaller doses (5 to 10 grains) will probably be quite sufficient.

Trichina spiralis.—This worm, causing "trichiniasis," may affect man from the eating of "measly" pork. Pigs, seemingly in excellent health, may harbour the worms, which at a certain stage in their life-history become encysted in the muscles (flesh), and, if the meat be eaten smoked or imperfectly cooked, there is considerable risk of the human being becoming a host for the worms. When trichinous pork is eaten, the capsules are digested, and the worm matures in about three days. Hundreds of embryos are produced in a few days from a single female; these pierce their way through the intestinal wall, and within a few weeks become encysted within the various muscles of the human body. During the early stage, when the embryos are boring their way to the muscles, there is considerable fever, abdominal pain, and diarrhœa (sometimes typhoid fever is suspected). When they reach the muscles, these become tender and swollen. If the respiratory muscles, such as the diaphragm, are involved, there may be considerable shortness of breath, and the patient may even die after a period of prolonged and increasing general ill-health. The treatment should be preventive, by the proper inspection of all pigs killed, and by the avoidance of uncooked or partly cooked (smoked) pig's flesh. If the discovery is made within a day that the person has eaten trichinous pork, then a 5-grain dose of thymol powder should be taken, followed by a good dose of castor oil or Epsom salts, so as to kill the parasites and sweep them out of the bowel, before they can migrate into the muscles. Once they have reached the muscles and have become encysted there, there is really no treatment which can be directed towards their removal.

Filaria.—Infection by filariæ takes place through the medium of mosquito bites, that insect acting as the intermediate host of the worms. The embryos of the filariæ may often be found in the circulating blood of affected persons in large numbers, but without giving rise to any very special symptoms. Trouble only arises when an adult worm invades some of the lymph channels, giving rise to elephantiasis, large swellings in the scrotum, the presence of chyle (milky-looking fluid) in the urine, &c. The treatment is mainly surgical. (See Elephantiasis.)

Guinea-worm.—This worm occurs in many parts of the tropics, especially of the Old World. It is several feet in length, but very slender. It probably passes the intermediate stages of its life-history in the water-flea, and enters the human body as a larva in drinking water. From the stomach it finds its way to some part of the subcutaneous tissues, most commonly about the region of the ankle. There it begins to grow, with all the appearances of the development of a boil at the spot. This bursts, leaving a shallow ulcer, at the bottom of which is a small hole, in which the head of the worm may appear. Milky fluid can be seen coming out from the hole, this containing hundreds of the developing worm embryos. After two or three weeks the worm itself usually emerges. The usual native method of treatment consists in getting hold of the head of the worm and pulling it out by winding round a piece of stick, a few inches each day. There is great risk in this way of breaking the worm and liberating a host of embryos into the subcutaneous tissues, and it is much better to have some 1 in 1000 solution of corrosive sublimate injected into the worm, or the cavity in which it is lying, so as to kill it, when it may be extracted easily. Prevention consists in careful filtration or sterilisation of all drinking water used in tropical regions.

(*b*) *Tape-worms.*—Several species of tape-worm infest human beings, depending on the animal from which infection is obtained. Thus the common form in this country is the *Tænia mediocanellata,* which is the tape-worm occurring in the ox, and which gains entrance into man usually through eating imperfectly-cooked beef. The commonest form on the Continent is the *Tænia solium,* coming from the pig. Another form is the *Bothriocephalus latus,* found in Switzerland and the countries around the Baltic, the usual hosts of this species being pike, trout, and other fresh-water fish. The infection is similarly obtained by eating the raw or only partially-cooked flesh of the fish. Tape-worms fasten on by their small heads to the interior of the gut, while their long white bodies, flattened like a piece of tape, but partially divided across into a large number of segments, lie loose in the interior of the bowel, and may be many feet in length.

The symptoms produced by them are by no means always very distinctive. The patient may not suffer at all, but colicky pains, dyspepsia, and capricious or voracious appetite may be present. A huge appetite is, however, by no means so common as is usually supposed. The only means of being certain of their presence is by seeing portions of the worm in the stools.

Infection with tape-worms should never occur if care is taken not to eat uncooked meat. To get rid of them the patient should starve for eighteen to twenty-four hours, and then take a dose of some substance which stupefies or kills the worm. Of these, one of the most satisfactory is the male-fern or filix-mas, and from 1 to 2 drachms of this should be obtained emulsified with cinnamon water and taken. After four or five hours a purge, such as a tablespoonful of Epsom salts in a tumblerful of water, must follow. To be certain of success, the stools should be searched carefully to see that the head of the tape-worm (at the smaller end) has come away. If it is left, repeated doses will be necessary, otherwise the worm simply grows again.

The intermediate stages of certain tape-worms sometimes occur in man; thus the cystic stage of the *Tænia solium,* which is usually passed in the pig, sometimes occurs in man, in which case it goes by the name of *Cysticercus cellulosæ.* The little cysts containing the worms only give rise to trouble when they occur in or invade certain parts of the body, such as the eyeball, brain, or spinal cord. In these situations they give rise to symptoms much the same as tumours in corresponding places, and are only amenable to removal by surgical means, if at all. Happily this condition is a rare one.

A commoner form of the cystic stage of a tape-worm in mankind is that known as *hydatids* or *hydatid disease.* The adult form of this worm (*Tænia echinococcus*), which is a very small one, is passed in the dog, and hydatid disease occurs most frequently in countries where men and dogs live in very close community. In this country certain sheep-raising districts are most affected, but Australia is the place where the disease is commonest. The hydatid cysts may occur in almost any part of the body, and may grow to a huge size, giving rise to symptoms from their mere size and pressure. Suppuration is also liable to occur within them, and they may burst into various surrounding structures. The symptoms depend primarily upon the situation, but there is generally a definite swelling which contains fluid, and a peculiar thrill is often obtainable on tapping the swelling. The diagnosis is generally clenched by withdrawing a little of the fluid with a syringe, and examining it for the presence of certain characteristic hooklets which come from the heads of the embryos in the hydatid cyst. The only satisfactory method of cure is to have the cyst completely evacuated surgically. If suppuration occurs within a hydatid cyst, it may have to be laid freely open and drained, just like any other abscess cavity.

(*c*) *Flat worms,* or *flukes* (or, as the disease is sometimes called, *distomiasis*).—The commonest and most important worm belonging to this class which is parasitic in man is the *Bilharzia hæmatobium,* a small worm which somehow or other (probably through drinking water, but not known with certainty) gains entrance into the bladder and other parts of the urinary system. The chief symptom of its presence is the more or less constant presence of blood in the urine; in severe cases inflammation of the bladder and extension of suppuration into surrounding structures may occur. The patient is apt to become weak and anæmic from the constant loss of blood. Sometimes the rectum is also invaded by the parasites, in which case there will be symptoms like chronic dysentery, with pain and straining in the back passage, and bloody stools. The diagnosis is made certain by microscopic examination of the urine, in which can generally be found quite easily the eggs, which have, very characteristically, a little spine on them. This disease can be picked up in almost any part of the continent of Africa, but in few other places. There is, unfortunately, no remedy known which has any certain action in killing out the worm in the bladder or elsewhere, but sometimes it seems to die out of its own accord, and a natural cure results. Affected persons should lie up in bed if the bleeding takes a bad turn, and anything which aggravates inflammation of the bladder must be avoided, such as chills, violent muscular efforts, alcohol, and any spiced or highly-seasoned foods. If there is any definite cystitis or inflammation of the bladder, this must be treated on the usual lines. (See under Bladder, Diseases of the.)

Liver-flukes are common parasites in sheep, but only rarely affect man. In certain districts of Japan 20 per cent. of the inhabitants are said to be affected, but this is almost an unparalleled occurrence. The symptoms are tenderness over the liver, recurring attacks of jaundice, diarrhœa, emaciation, and gradual loss of strength. Dropsy of the legs and abdomen may come on, and death from exhaustion. There is no treatment for the condition beyond the use of good food and stimulants.

Lung-flukes, parasites which attack the lungs and bronchial tubes, are not uncommon in China and some other parts of the Far East. The chief symptom is cough and spitting of blood, especially in the morning, but patients may live for many years without much discomfort or deterioration in health beyond this chronic cough, and perhaps some secondary anæmia from repeated hæmorrhages. There is no satisfactory treatment.

Paratyphoid.—A fever closely resembling typhoid fever, but due to a slightly different germ. The differences in symptoms and treatment are so insignificant as not to require any mention here. (See TYPHOID FEVER.)

Paresis.—This word is used in two different senses: it may mean either a condition of slight or partial paralysis (see PARALYSIS), or it may be used—and very commonly is so, especially in America—as equivalent to the condition usually termed, on this side of the Atlantic, at any rate, general paralysis of the insane. (See under INSANITY.)

Parkinson's Disease is another name for *Paralysis agitans*, or the shaking palsy. (See under PARALYSIS.)

Parotid Gland, Affections of the.—The parotid gland, the largest of the glands which secrete the saliva, is situated just in front of and a little below the ear. The most common affection of it is epidemic parotitis, or mumps. (See MUMPS.)

Concretions or calculi sometimes form in and block the duct of the gland, in which case it becomes swollen and enlarged during and after meals, the swelling slowly passing off as the saliva finds its way past the obstruction. If the obstruction is complete, a cyst may form, and an opening occurs through the cheek, through which saliva trickles. The treatment consists in removal of the obstruction through a suitable incision.

Tumours of the parotid are not infrequent, a swelling, usually hard, appearing in the gland and gradually enlarging. Some of these tumours are not particularly dangerous, but others are of a highly malignant character. Their nature can only be satisfactorily ascertained by microscopic examination of the growth, and it is always advisable to have any growth in this neighbourhood removed as soon as possible.

Paroxysmal Hæmoglobinuria.—A condition in which the urine every now and again becomes red from the appearance of blood pigment in solution in it. This is usually due to exposure to cold in certain specially sensitive individuals, although it may also be brought on in other ways—*e.g.* by the taking of certain drugs, such as quinine, in excess—and it may be associated with other diseases, such as malaria or black-water fever, or with Raynaud's disease, in which cold brings on a very painful spasm in the vessels of the extremities, making them go first dead white, then blue and congested, and sometimes going on to gangrene. The chief point in treatment consists in avoidance of the things which bring on the attacks, such as exposure to cold. See also under BLADDER for conditions in which blood and blood-colouring matter appears in the urine.

Parrot Fever, or Psittacosis.—This is a very fatal form of disease amongst parrots, and which may spread to man. The symptoms are either like those of typhoid fever or pneumonia, and suspicion may be aroused if sick parrots are found in a house with persons suffering from pneumonia- or typhoid-like symptoms. The treatment must be on the same lines as for these diseases.

Parturition, Affections of.—See LABOUR, COMPLICATIONS OF.

Pediculi, or Lice.—See under PARASITES.

Pellagra.—A disease which is common in Southern Europe, especially Italy, and which has recently been assuming epidemic proportions in the United States. It attacks both sexes and all ages. The cause of the disease is not certainly known, although it is generally attributed to eating unsound maize or some preparation made from such diseased grain. The most marked symptoms are skin rashes and mental disorders. As a rule there is a preliminary stage of several months, in which the patient is out of sorts, with dyspepsia and vague pains in the back and head. Then a red swelling appears on the exposed parts of the body, especially the back of the hands and on the face and neck, and more marked dyspepsia and diarrhœa. These symptoms may pass off, but there is almost certain to be a recrudescence in a few months, and, sooner or later, wasting, paralysis, intolerable itching and burning of the skin in various parts, and mental symptoms, usually of a melancholic nature, come on. A considerable proportion of those affected end their days in asylums, hopelessly insane. There is at present no satisfactory treatment for the disease, and one is hardly likely to be found until the exact cause of the condition is ascertained. Meantime the possible danger of eating any maize or Indian corn which is in any way tainted must be borne in mind.

Pemphigus.—See under SKIN DISEASES.

Penis, Diseases of the.—Congenital malformations of the penis and surrounding parts are occasionally met with, and should be noticed in infants immediately after their birth. Many of these malformations are capable of being entirely or partially remedied by operative measures. Many of the cases of so-called hermaphrodites are really examples of congenital malformations of the external male sexual organs, so that the appearances closely resemble those of a female, and the individual may even be brought up as a female for a number of years, until their later physical development and sexual feelings give rise to suspicion as to the true state of affairs.

The foreskin is sometimes so long and tight that it cannot be drawn back, a condition technically known as *phimosis*. It may be so tight as to render the act of making water difficult, and it almost invariably leads to retention of skin secretions under it, with considerable irritation, going on even to inflammation under it. Other troubles that it may lead to are constant pulling at it to relieve the irritation, which may lead to the habit of masturbation being acquired, and more remote troubles sometimes associated are convulsions and St. Vitus' dance. The treatment of phimosis consists in circumcision, or cutting off of the foreskin, an operation which should be performed within the first year of life, when it is a comparatively trifling affair, giving rise to very little inconvenience. It requires to be done with proper antiseptic precautions against blood-poisoning and against hæmorrhage, however. In many races and countries circumcision is performed as a routine in all male children, even where the foreskin or prepuce is not particularly tight. In warm countries there is a good deal to be said in favour of this practice, as it certainly tends to a condition of greater cleanliness.

A tight foreskin is sometimes pulled forcibly back behind the bulbous end (glans) of the penis. This leads to the end very quickly becoming greatly swollen—a *paraphimosis,* as it is called—and, if left untreated, ulceration occurs at the line of constriction. The treatment consists in forcible replacement, by grasping the penis between the first and second finger of each hand, and compressing the glans with the thumbs, so as to compress the blood-vessels in it and thus reduce its size. At the same time the fingers draw the foreskin forwards. After the irritation has gone down, circumcision should be performed to prevent any recurrence of the condition.

Inflammation under the prepuce, or *balanitis,* may arise either from want of cleanliness with a long foreskin, or it may accompany the discharge of a gonorrhœa or other venereal disease. (See VENEREAL DISEASES.) In simple cases all that is required is to thoroughly cleanse the parts by washing, and apply a little lead lotion to allay the irritation. If there is much discharge and the foreskin is long and swollen, the foreskin should be slit up, and, when the parts have been restored to a healthy state, it should be circumcised.

Warts and tumours may grow on the penis, and generally require removal by operation; but it should be remembered that the hard chancre or sore of syphilis looks very like a wart.

For *discharges* from the pipe of the penis, see *Gonorrhœa,* under VENEREAL DISEASES.

Injuries to the urethra, or pipe in the penis down which the urine escapes from the bladder, are easily acquired by falling astride a fence or the like. There is considerable pain, escape of blood from the orifice of the urethra, and swelling up of the scrotum from escape of blood into it. If the patient attempts to pass water, which he should not do if he can possibly help it, the urine finds its way into the tissues of the scrotum and the fork. A surgeon should be seen as soon as possible, so as to have the rent in the urethra repaired.

Foreign bodies are sometimes passed up into the orifice of the urethra at the point of the penis by boys, especially such things as pieces of slate-pencil. They are apt to travel up a considerable way, and give rise to partial or complete obstruction to the passage of water. Attempts should not be made at home to take them out, unless they are actually sticking out of the orifice, as more injury is apt to be done if suitable instruments are not used.

Stricture of the urethra, leading to more or less complete difficulty in passing water, is a condition which may come on from several causes. The condition generally comes on gradually, the person complaining of increasing difficulty in getting the bladder emptied. The stream often becomes forked or twisted, and frequently, after the bladder seems to have been emptied, some more trickles away, wetting the patient's clothes. Matters are often brought to a head by the individual getting cold or wet, indulging too freely in alcohol, or having the fork irritated by a long ride on horseback or on a bicycle. Any of these things may set up a condition of spasm in the already partially obstructed channel, and cause complete stoppage. The bladder becomes greatly distended, causing great discomfort. Stricture is most commonly the result of an old attack of gonorrhœa. The element of spasm in a stricture can be relieved by putting the patient in a hot bath, and, if necessary, unloading the bowel by a large warm-water enema. This is all the home treatment which should be attempted, and it is generally sufficient to give the patient temporary or partial relief. Further measures may consist in dilatation of the stricture by instruments, or cutting of the stricture, or simply the passage of catheters to draw off the water. All depends upon the nature of the stricture, its situation, the occupation and age of the patient, &c., and what is best can only be decided after examination by the doctor.

Perforation of the Stomach or Intestines is one of the most serious complications which can ensue on any ulcerated condition of these organs. It may also result from blows over the abdomen, and from stabs or gun-shot wounds. The danger lies in the escape of the contents of the organs into the abdominal cavity, setting up peritonitis. The immediate signs of perforation are usually collapse, pain and tenderness over the abdomen, and distension. Operation is practically the only hope of saving the patient's life. One exception might be made to this—namely, perforation from small high-velocity bullets. Experience has shown that, in the case of these, if operation cannot be performed within a very few hours of the occurrence, as is often the case on the battlefield, it is better simply to cover up the patient and keep him warm where he lies, to give him no food or drink, and to ensure perfect quiet, both of his limbs and of his internal organs, by a dose of opium (30 drops of laudanum) or morphia (a quarter to half a grain). The risk is less by this method than by carting him about for miles and hours before he can be attended to. Perfect quiet gives nature a chance to close up the small perforations, whereas jolting simply sends more and more bowel contents into the abdominal cavity.

Pericarditis.—See under HEART, DISEASES OF THE.

Periods, Disturbances of the Monthly.—See MENSTRUATION, DISORDERS OF.

Periostitis means inflammation of the periosteum, or surface of a bone.—See BONE, DISEASES OF.

Peripheral Neuritis is another name for multiple neuritis.—See under NERVES, DISEASES OF.

Peritonitis.—Inflammation of the membrane covering the bowel and other abdominal organs, and lining the interior of the abdominal cavity in which these organs lie. This disease may be acute or chronic, localised over one particular organ or part of the peritoneum, or affecting the whole of the abdominal cavity. Let us take firstly the most serious, and perhaps also the commonest, form, *acute generalised peritonitis.* Very occasionally this commences in a person previously quite well and with no other disease, or, at all events, no symptoms pointing to any affection of any of the abdominal organs, but in the great majority of instances it is due to the extension of inflammation from some organ covered by the peritoneum, from the perforation of some similarly covered hollow organ, or from rupture of an abscess into the abdominal cavity. Thus peritonitis from perforation may occur from typhoid, cancerous, tubercular, or simple ulcers of the stomach or intestines, or from perforation of the appendix or gall-bladder. In any of these instances the contents of the organ, including innumerable germs, are let loose in the abdominal cavity, and very quickly set up acute inflammation. Rupture of an abscess or collection of pus into the abdominal cavity is most likely to occur in connection with acute appendicitis, abscess in the Fallopian tubes in women (see under WOMEN, DISEASES PECULIAR TO), or abscesses in the liver. Peritonitis may arise by extension from any of these inflammatory processes mentioned without any actual perforation or rupture.

Symptoms.—If the patient is already seriously ill, particularly if he is in a stuporose condition—as, for instance, in typhoid fever—the onset may be gradual and the symptoms masked by those of the primary disease. Generally, however, the onset is sudden, and the symptoms severe and striking. The most important signs are severe abdominal pain and great tenderness to pressure over the abdomen, increasing abdominal distension, and persistent vomiting, fever, and collapse of the patient. The pain may be at first local, over the site of the primary disease, but it soon becomes general over the whole abdomen. The abdominal muscles are kept rigid and board-like, and the patient generally lies on the back with the knees drawn up, so as to minimise the tension within the abdomen. Movement of any kind, and talking, coughing, &c., are indulged in as little as possible, on account of the pain caused; and for the same reason the respirations are very shallow, being more rapid in order to make up for their diminished amplitude. The temperature is not a very good guide to the severity of the case; it may be high (104° F. or more), ordinarily it is only 101° F. or 102° F., and sometimes is not raised at all. The pulse is generally more uniformly quickened (120 to 150 or so), and is very small and wiry. The symptoms are not just very different from those of acute gastro-enteritis, or inflammation of the interior of the bowels (see under INTESTINES, DISEASES OF THE), obstruction of the bowels or acute appendicitis; but, after all, it does not matter a great deal, from the point of view of diagnosis and treatment, if it is recognised that the patient is suffering from an acute abdominal condition, and if the urgent necessity for surgical measures is appreciated. What the condition exactly is, does, of course, make a considerable difference to the patient's chances of recovery. In acute generalised peritonitis the outlook is always a very serious one, and in most cases, if good surgical aid cannot be obtained early, there is very little hope of recovery.

In connection with the treatment a good deal depends on the cause of the peritonitis, so that it is important that any facts leading up to a possible cause should be borne in mind. Thus, any history of attacks of pain in the stomach suggesting the presence of a gastric ulcer may be important, or a history of some recent discharge from the front passage as pointing to an acute inflammation of the Fallopian tubes. Previous to a surgeon seeing the patient and deciding whether operation is to be done or not (and, generally speaking, it offers about the only chance of recovery), the patient should be in bed, with a cage of some sort over the abdomen so as to take off the weight of the bedclothes. Either poultices, hot fomentations, or ice-bags should be applied to the abdomen. Ice, if available, in many cases gives the most relief, and also tends to check the distressing vomiting. If the abdominal distension is great, a rubber tube, warmed in hot water and lubricated with a little oil, may be passed up the rectum for a foot or eighteen inches (provided that it goes easily, without any great force). This, by drawing off gas, gives considerable relief. Giving purgatives to excess, as is sometimes practised, is not to be recommended, especially if there is a perforation or obstruction of the bowel; but in other cases saline purgatives, such as a tablespoonful or two of Epsom salts or sulphate of soda, may be useful. The thirst, which is often very trying, can be best relieved by rinsing the mouth with a mixture of one part of glycerine to three parts of water, with a few drops of lemon-juice added. The question of giving opium or morphia is one which always has to be considered. Our advice would be, if the patient can stand the pain, do not give it until he has been seen by the doctor, and the question of operating or not operating settled. If given before, it masks the patient's real condition, and may lead to postponement of operation when it should really have been done. If, however, the patient is in agony, then enough may be given to allay the pain somewhat. Twenty drops of laudanum may safely be given to start with, and, if that does not soothe, may be repeated in two or three hours; but it should not be given in doses large enough to make the patient so comfortable that he feels nothing wrong, and make him inclined to refuse operation. Opium can often be taken in enormous doses in peritonitis, and in those cases where surgical aid cannot be obtained there is, of course, no object in withholding it, as the most that can be done then is to render the patient's end as comfortable as possible.

In *acute localised peritonitis* the symptoms resemble those of the generalised form except in degree, the pain and tenderness being limited to the neighbourhood of the part of the peritoneum involved. It frequently happens in this case that the inflammatory focus becomes shut off, and the patient is left with nothing more than a shut-off abscess—always a point of danger of further spread, however. The commonest situations in which a localised abscess can get formed in this way are: round the appendix, after an attack of acute appendicitis; in the pelvis, especially in women; and in the upper part of the abdomen, just below the diaphragm. The same line of treatment as that recommended for appendicitis should be followed in these cases.

Chronic peritonitis is in most cases a tubercular peritonitis, and, as a rule, is associated with tuberculosis in some other part of the body, either in the lungs or, more commonly, inside the bowel, or causing enlargement of the lymphatic glands at the attachment of the bowel to the back wall of the abdomen (the condition known technically as *tabes mesenterica*). The affection is usually met with in children or young persons. The symptoms are rather variable, and not always very definite in character. Almost any form of digestive disturbance may occur; the abdomen is commonly swollen, sometimes tender, and hard or resistent masses may be palpable through the abdominal wall. Sometimes there is considerable fever of a hectic type, in others there is little rise of temperature. The onset is always gradual, and the condition of the patient gets steadily worse, although there may be periods of intermission followed by relapses. General wasting soon becomes a feature of most cases.

Tubercular peritonitis is not such a serious malady as acute peritonitis, as in many cases a cure can be obtained. The general treatment is much on the same lines as for other forms of tubercular disease. The food should consist of an abundance of sustaining but easily digestible foods, such as milk, eggs, and beef-juice. Cod-liver oil, malt extracts, and some one or other of the numerous chemical foods, or syrups of the phosphates or hypophosphites, should also be given. The patient ought to live in the open air as completely as circumstances will permit. Of other drugs that are valuable two may be mentioned—namely, guaiacol and iodoform. Ten drops or so of the former may be mixed with a dessertspoonful of cod-liver oil and smeared over the abdomen, which is then wrapped up with a flannel binder. The friction between the binder and the skin is sufficient to rub in the remedy. Iodoform may be used in the same manner, 5 to 10 grains being mixed up with an ounce of oil and applied every night; or 5-grain iodoform suppositories may be employed, one each evening.

In cases which are getting worse in spite of such treatment, and particularly in those cases where the abdomen is becoming much distended with fluid, surgical measures are more successful. The mere opening of the abdomen and removal of the fluid is frequently sufficient to cause such cases to heal and establish a cure.

Perityphlitis means inflammation in the neighbourhood of the appendix—that is to say, in the lower right-hand portion of the abdominal cavity. The name is now little used, as it is recognised that this condition practically always starts with a typical attack of appendicitis, and it may be regarded as an abscess or localised peritonitis occurring as the result of an acute appendicitis, and should be prevented by early operation in that disease. (See APPENDICITIS.)

Pernicious Anæmia.—See under ANÆMIA.

Perspiration, Abnormalities of.—See under SKIN, DISEASES OF THE.

Pertussis.—Another name for whooping-cough. (See WHOOPING-COUGH.)

Peruvian Wart.—See VERRUGA.

Pest.—The old name for plague. (See PLAGUE.)

Petit Mal.—The name given to the lesser attacks of epilepsy. (See under EPILEPSY.)

Pharyngitis, and other diseases of the pharynx.—See under THROAT, DISEASES OF THE.

Phimosis.—See under PENIS, DISEASES OF THE.

Phlebitis means inflammation of the veins. (See under VEINS.)

Phosphaturia.—The name given to a condition in which there is a precipitation of phosphates appearing in the urine on standing. The phosphates may be recognised as a heavy white precipitate. Phosphates form a constant element in the urine, but it is only in diseased conditions that they appear as an actual sediment. One of the commonest conditions in which they are found is when the urine becomes alkaline, especially when there is inflammation of the bladder. In this condition the urine is foul-smelling, even immediately on passing. Phosphates may also be excreted in excess, and appear as a sediment in conditions where there is a great nervous exhaustion.

Treatment.—The treatment for phosphaturia consists, in the first instance, of substances which tend to prevent decomposition going on in the urine. One of the best known of these is urotropine, which may be taken in doses of about 10 grains, dissolved in water, thrice daily after meals. Where the phosphaturia is the result of nervous exhaustion, patients are recommended to take some bitter tonic, as, for instance, Easton's syrup, half a teaspoonful thrice daily before meals. In more severe cases a holiday from work, or a regular rest-cure, as described under the treatment of neurasthenia, may be necessary. (See also under BLADDER, DISEASES OF THE.)

Phossy Jaw.—A condition which used to be met with in match factories, but one which is now practically unknown, owing to the regulations which have been instituted in connection with the manufacture of matches. The condition consists essentially of a rotting away of the jawbone from the action of the phosphorus fumes. It only occurred where there were decayed teeth, through which the fumes could reach the underlying jawbone; and in many cases a tubercular disease of the bone was superadded to the decayed condition brought about by the phosphorus. Proper attention to the teeth will therefore prevent this condition from occurring in those workers who might still be exposed, in any manufacturing process, to phosphorus fumes.

Phthisis.—See CONSUMPTION.

Pigeon Breast.—A deformity of the breastbone causing it to project forward in a manner suggestive of the breastbone of a bird. The condition is most commonly due to rickets, in which the bones are unduly soft; but it may also be due to other causes, including anything which obstructs the free entrance of air into the lungs in young persons, such as adenoids, enlarged tonsils, asthma, or even repeated attacks of bronchitis. When there is not free entrance of air into the lungs, the wall of the chest, instead of expanding, tends to sink in as the child grows, the breastbone, however, remaining in its natural position, so that, compared with the sunken ribs, it appears to project unduly. (See also under CHEST, DEFORMITIES OF THE, and under RICKETS.)

Piles.—By piles or hæmorrhoids is meant a varicose condition of the veins surrounding the anus and lower part of the bowel. By the term "an attack of piles," which is commonly used, is meant an attack of inflammation in these veins. The commonest symptom which leads one to suspect the presence of piles is hæmorrhage from the bowel and pain when the bowels are moved. But it must be borne in mind that piles are not the only condition which may give rise to these symptoms, especially in elderly people. Cancer of the rectum, for instance, in its early stage presents very similar appearances, so that, when an individual in middle life fancies he has more or less suddenly developed piles, suspicion should be aroused that it *may*, at least, be something more serious.

Piles are of two varieties, external and internal, the external piles surrounding the anus and being covered with skin, the internal piles consisting of distended veins covered with the mucous membrane of the lower part of the rectum. Usually both varieties are present together. The internal piles are apt to give rise to projecting fleshy-looking masses, which readily bleed and cause considerable pain and inconvenience, but they are not nearly so subject to attacks of inflammation as external piles. The causes of piles are fairly numerous. Sedentary occupations, chronic constipation, alcoholic excess—all of which conditions lead to a chronic congestion of the liver, which tells back upon the veins of the lower part of the bowel—are frequent precursors of piles. The condition is very seldom one which comes on suddenly, although circumstances, such as the use of drastic purgatives or a chill—not necessarily obtained by sitting on damp grass, although this is popularly regarded as being the usual cause of piles—may bring the symptoms to a head by causing an attack of inflammation in the piles, which in all probability have already been there unnoticed for some time. Young men are much more subject to them than young women, especially if circumstances compel them to lead a sedentary life. Pregnancy, however, from the obstruction which it causes to the venous circulation, very frequently leads to the development of piles in women. In middle life they do not commonly make their appearance, but in elderly life, again, they not infrequently occur for the first time.

External piles give rise to little in the way of symptoms beyond a sense of fulness and irritation immediately before and after the bowels move. When inflamed, however, they appear as tense, bluish, rounded structures, exceedingly painful and tender, and often prevent the patient from sitting or walking in comfort. These "attacks of piles" generally last three or four days at a time. The symptoms arising from internal piles are often not very marked until bleeding occurs, although from their protrusion the patient has a sensation as if a foreign body were present in the bowel; and occasionally a protruding pile may become so nipped that, if it be not pushed back with the finger, it becomes more and more swollen and painful, and acutely inflamed, giving rise to very considerable suffering, with general sickness and fever. Piles require to be diagnosed chiefly from prolapse of the rectum and from cancer. (See under Rectum and Anus, Diseases of the.)

Treatment.—The treatment of external piles when uninflamed is very simple. The most important point is to prevent constipation by suitable exercise, diet, and, if necessary, the use of medicines. (See under Constipation.) The parts should be kept thoroughly cleansed, and great care taken not to irritate them by the use of hard toilet paper. It is preferable, indeed, to use a little moist cotton-wool instead of paper. It is also advisable to smear the parts occasionally with some astringent ointment, such as ointment of witchhazel. For inflamed external piles the patient should, if possible, stay in bed for a couple of days, having the bowels opened by copious enemata of warm water, and apply hot fomentations over the anus. If the pain is very great, it may be necessary to have the inflamed pile incised and the clot shelled out; but, generally speaking, it is but rarely that operation is required for external piles.

The treatment of internal piles to be efficacious must be both general and local. The general measures consist in removing all possible sources of congestion of the liver, and of sluggish circulation in the veins coming from the lower part of the bowel. Regular action of the bowels should be maintained, as directed under the treatment of constipation, and, if aperients are required, the best form which they can take is either one of the natural mineral waters or some saline aperient first thing in the morning, such as, for instance, a tablespoonful of sulphate of soda or citrate of magnesia in a tumblerful of water. It is important to avoid the use of such aperient drugs as aloes. This tends to increase the congestion of the veins in the lower part of the bowel; and it may be mentioned in this connection that this drug is the commonest constituent of many patent medicines with an aperient action.

Local Treatment.—When internal piles protrude, they should be sponged with cold water after movement of the bowels, and gently pushed back with the finger. The use of witchhazel ointment or the injection of hazeline lotion, diluted some six or seven times with water, is also advisable, and bleeding from piles can often be arrested by this means. The old-fashioned gall and opium ointment is neither so efficacious a remedy, nor yet so cleanly a one, as those mentioned. If there is much pain, or if bleeding is so profuse that the patient is becoming weakly and anæmic, then the piles must be removed by operation. There is no other way of getting completely rid of them.

Pimples.—The ordinary cause of a "pimply" face is acne (see Acne), but other skin diseases also cause little eruptions on the skin which may quite properly be designated pimples. (See Skin Diseases.)

Pink Eye.—A disease of horses, which occasionally occurs also in man. It is believed to be closely analogous to, if not actually identical with, influenza, the chief symptom of this particular form of it being conjunctivitis—that is, a red, inflamed condition of the white of the eye and inner surface of the eyelids. The treatment is the same as that of other forms of conjunctivitis, for the details of which see under Eye, Diseases of the.

Pinta.—A skin disease, or perhaps rather a group of skin diseases, occurring chiefly in Central and South America. They are characterised by the development of patches of different colour on the skin, due to the growth of various species of fungi upon it. The condition is easily recognised if the services of a microscope be available, a scraping from the coloured patch revealing the presence of the mould or fungus. The treatment may consist either in painting the patch with tincture of iodine or with citrine ointment (containing nitrate of mercury).

Plague—or, to give its full name, *bubonic plague*—is an acute infectious and contagious disease characterised particularly by the development of buboes, or carbuncle-like swellings, in the lymphatic glands of various parts of the body.

This disease is probably the same as that which was known in the Middle Ages as the "Black Death," and the Great Plague of London in 1666 was unquestionably a severe epidemic of this disease. It is now chiefly a disease of India and China, from some parts of which it is rarely absent. From there it tends to spread to various parts of the world, and within the last twenty years there have been outbreaks of it in almost every part of the globe. It is now known to be due to a special germ, the *Bacillus pestis*, and the most important fact recently elicited with regard to the causation of the disease is that the infection is almost invariably conveyed to man through the bite of the flea. The disease appears to be constantly present amongst certain of the lower animals, particularly the rat, and the germs are conveyed, through the medium of fleas from infected rats, to man. The disease, therefore, principally attacks the poorer classes and those who live in dirty surroundings. But, granted the possibility of being bitten by infected fleas, it may attack persons of all ages and of either sex indiscriminately. This mode of spread from animals to man through the medium of insects carrying the germs accounts for the way in which the disease is spread along pilgrim routes, and by ships from port to port. At present there seems a strong probability that the disease has obtained a footing amongst the rats of some of the eastern counties of England, and possibly also of the port of London; if this report turns out to be accurate, it is not improbable that outbreaks of plague will occur from time to time throughout this country, as it is almost an impossibility to get the disease stamped out amongst the rats.

Symptoms.—After infection there is a period of from two to seven days before symptoms appear. Then the patient begins to suffer from symptoms more or less common to all fevers in their initial stages—namely, prostration, headache, backache, shivering fits, and rise of temperature; occasionally there is sickness and vomiting. After two or three days of this the typical glandular swellings appear in the armpits, the groins, and the neck. These swellings are extremely painful and tender, and after about a week they usually suppurate and rupture, discharging foul-smelling matter. After the appearance of the enlarged glands there are often also carbuncles and areas of hæmorrhage or of gangrene in the skin of various parts of the body. The black colour of these gave rise to the old name of the "Black Death." When the swellings begin to discharge, the temperature commences to fall, and convalescence may be regarded as starting. If the glands do not discharge freely, the attack is usually of a more virulent nature, and is frequently fatal.

Some cases of plague are exceedingly mild, the patient being able to go about his work the whole time, suffering merely a little inconvenience from the swellings. These cases are equally dangerous to others, since infection may be spread from them just as much as from a severe case.

Plague may take another form—namely, the pneumonic form, in which the symptoms are almost identical with those of an attack of pneumonia. The sputum, however, instead of being scanty and rusty-looking from streaks of blood, is copious, watery, and thickly streaked with bright-red blood, and on microscopic examination it can be shown to contain myriads of the plague bacillus. This form is more common in children than in adults, and is exceedingly fatal, few cases, indeed, surviving the third day of the attack.

Occasionally attacks of plague run a somewhat chronic form, the buboes or glandular swellings appearing and continuing to discharge over a period of several months.

Treatment.—Preventive measures consist in avoiding too close contact with plague cases; and those in attendance on plague cases must be exceedingly careful to see that they have no wounds or scratches about their fingers, because infection from the discharges may readily occur through any abrasion of the skin. Needless to say, war must be waged against fleas, and it will be advisable for any one coming into anything like close contact with plague cases to carry a small bottle of chloroform to sprinkle over the underclothing if one of these creatures gets on to the skin. The general measures against the spread of plague consist in strict attention to cleanliness of dwellings, and extermination, as far as can be, of rats. On board ship they are prevented from getting ashore by placing guards over all moorings, and by a strip of tar a couple of feet wide across all gangways. Rats are said to be unable to cross this.

Inoculation against plague has also been tried on a comparatively large scale in India, with considerable success. The immunity obtained by inoculation only lasts three or four months, however, and on this account, and also on account of the discomfort for two or three days from the inoculation itself, it can scarcely be recommended except for those whose duties actually bring them into close contact with plague cases.

The treatment of the disease itself is wholly symptomatic. At the commencement of the attack the patient should be given a strong purge, preferably by means of calomel, say 3 to 5 grains as a pill, followed, if necessary, by salts the next morning. Some writers with large experience of treating plague recommend the use of somewhat smaller doses of calomel throughout the attack, believing that it checks the vomiting and promotes the taking of nourishment. For the restlessness and pain it is practically always necessary to give opium or morphia, the latter, given hypodermically, being preferable. The diet should be entirely liquid, given in small quantities frequently, as recommended in the general treatment for fevers; but in plague it will be found almost invariably necessary to give stimulants freely, and the best form of alcohol for the purpose is undoubtedly iced champagne, where that can be obtained. If the fever rises above 103°, or even where it is not so high, if the patient is very delirious, cold sponging will be found exceedingly comforting, and also successful in diminishing the fever and delirium. The glandular swellings may be treated either by the application of poultices or fomentations to hasten suppuration, or by the application of equal parts of glycerine and extract of belladonna. When they become soft and the skin over them red, indicating the formation of pus, they should be opened freely and treated, like any other abscess, with antiseptic lotions and dressings.

Pleurisy.—By pleurisy is meant an inflammation of the pleura, or membrane lining the chest cavity and covering the surface of the lungs. As a rule only the pleural membrane of one side is affected, and in most cases the affection is not one of the pleura alone, there being generally some affection of the lung beneath the pleura, or else of the chest wall. The first symptom of pleurisy is usually a severe pain in the side, often of a stabbing character, accompanied by cough and much aggravated by deep breathing. Pleurisy is a common result of exposure to cold or wet, and as such may occur in a perfectly healthy individual; but much more commonly it is likely to develop in a person with tubercular tendencies, and, indeed, an attack of pleurisy is often the beginning of consumption. Another cause of pleurisy is rheumatism, and probably most of those cases attributed to cold which are not definitely tubercular are rheumatic in their origin. Bright's disease also not uncommonly has pleurisy as a complication; and, along with such diseases of the lung as pneumonia, cancer, abscess, or gangrene, there is invariably more or less pleurisy.

The two chief forms of pleurisy are the dry and the wet forms. In the latter there is a large accumulation of fluid in the chest cavity. Dry pleurisy usually comes on suddenly, with the occurrence of sharp pain, felt, as a rule, on one side, somewhat below the level of the nipple. But occasionally in pleurisy, and also in pneumonia, the pain is felt much lower down in the abdomen, and such cases of pleurisy have not infrequently been mistaken for appendicitis or some other acute abdominal condition, especially in children. The temperature is a little raised, and the pulse-rate somewhat increased. The patient usually lies on the affected side, so that respiration may be carried on by the opposite healthy side of the chest. In this way the chest movements are diminished, and the pain caused by them lessened. To make up for the shallowness of respiration, the breathing will be noticed to be much more rapid than normal. If the hand is placed over the painful spot, the grating, rubbing movement due to the two inflamed surfaces rubbing together can sometimes be felt, and, when the doctor listens over this spot, the friction can, as a rule, be easily heard. In the wet form of pleurisy, or pleurisy with effusion, the pain is less in amount, and, in fact, may be absent, because the fluid separates the two inflamed surfaces from each other; but the breathlessness becomes much more marked, and the patient's face assumes a bluish colour about the lips, and the expression becomes anxious and worn. If the chest be examined in a good light, the absence of movement on one side is usually quite evident, and the spaces between the ribs can sometimes be seen to bulge quite distinctly.

An attack of pleurisy in a favourable case lasts some ten days or a fortnight; then the fever diminishes and the breathlessness disappears as the fluid gradually becomes absorbed. In the majority of cases a complete recovery may be expected. Sometimes, however, dry pleurisy may indicate a severe rheumatic injection, and, although the pleurisy clears up, the patient's general health still remains seriously affected. In the wet forms of pleurisy, when the fluid becomes excessive there is considerable risk from the compression of the heart, and there is the further risk that the fluid may become purulent—in other words, that an *empyœma* may form. (See below.) Further, in pleurisy with effusion due to tuberculosis, although recovery may be effected from the attack of pleurisy, it may be found that the lung has become the seat of consumption.

Treatment.—For dry pleurisy the patient should be confined to bed in a warm room, and some form of counter-irritation applied to the chest. The application of several small fly-blisters, or painting the painful area with iodine, is the best method of effecting this, mustard-leaves being simpler but not quite so efficacious. If the pain is very severe, the patient may be given a dose of Dover's powder, from 10 to 15 grains, at night, and, instead of blisters or other methods of counter-irritating the chest wall, it will be preferable to limit the amount of movement by applying several long strips of adhesive plaster in a horizontal line round the affected side of the chest, from the spine to the breastbone. These should be put on after a full expiration, so as to empty the lungs of air as completely as possible. If the patient is feverish, and particularly if there is much cough, the following mixture will be found advantageous:

℞ Sweet spirit of nitre	6 drachms
Citrate of potash	4 drachms
Syrup of tolu	1 ounce
Mindererus spirit	to 6 ounces

One tablespoonful to be taken every four hours.

In cases which are rheumatic in origin—and this can only be told by the patient either having or having had other evidences of rheumatism, such as swollen joints—the patient ought to be given some form of salicylates, say 20 grains of salicylate of soda or of aceto-salicylic acid, twice or thrice daily, in tablets or in solution. When the fever has quite gone, the patient should be allowed up, and the chest again painted with iodine to promote complete absorption of the inflammatory products and to prevent adhesions forming. Deep-breathing exercises or climbing of slight inclines will be found useful. As in all feverish affections, it should be mentioned that a purgative should be taken at the commencement of the disease, in this particular instance a good dose of salts being the most suitable; and, in cases where cough is very troublesome, small doses of opium, particularly in the form of Dover's powder, as mentioned above, may be taken occasionally, excepting where the pleurisy is complicating Bright's disease, in which the use of opium in any form is contra-indicated.

In pleurisy with effusion it is generally necessary to have the chest tapped and the fluid drawn off. This, of course, can only be done by a medical man, and the choice of the most suitable time for tapping must be left to him. The absorption of fluid may be helped by limiting, as far as may be, the amount of fluid drunk by the patient; but it is only in non-feverish cases that this is possible to any great extent, because, as a rule, the diet must be largely a liquid one, in accordance with the general rules of dieting in feverish ailments. After tapping, vigorous efforts to bring about the re-expansion of the lung, which will always be more or less collapsed, must be made. With this end in view the patient may be made to blow water forcibly out of a bottle through a spray, and he should also be required to take a certain number of long, deep breaths every hour. Persistent painting of the chest wall with iodine will also be found beneficial.

Empyœma.—This means a collection of pus or matter in the chest cavity. It may result from a simple pleurisy, or the fluid which collects may be purulent from the start. It is a common complication of such fevers as scarlet fever and measles, especially in children; and in those cases of pneumonia which do not have a proper crisis, sometimes dragging on long after the period at which they should have cleared up, the cause will frequently be found to be an empyæma. It may also be due to such local causes as fractures of the ribs, or extension of infection from the abdominal cavity through the diaphragm, or in connection with cancer of the gullet, or cancer within the lung itself.

The symptoms come on, as a rule, more insidiously than in simple pleurisy, but, when fully developed, are similar to those of pleurisy with effusion, except that generally the chest wall shows more bulging, and is likely to be red and puffy or dropsical. The patient also shows more signs of blood-poisoning from absorption of poisonous material from the pus within the chest. Thus the temperature is likely to be higher; there is more general weakness, feeling of being ill, and profuse sweats. In cases of doubt the diagnosis is made clear by the removal of a little of the fluid from the chest by a syringe. The outlook in empyæma is always more serious than in simple pleurisy, because, even although the patient recovers, it invariably results in some sinking in of the chest wall and a binding down of the lung. The treatment should be surgical as soon as the condition is diagnosed, free opening of the chest wall and drainage of the cavity being necessary, just as in the case of any other abscess. After satisfactory drainage is established, measures to secure re-expansion of the lung will require to be taken.

Plumbism is another name for chronic poisoning by lead. (See LEAD-POISONING.)

Pneumonia.—Medically speaking there are at least two very distinct forms of pneumonia, or inflammation of the lungs. One of these, known as broncho-pneumonia, is usually an extension into the lung of bronchitis, and affects many portions of both lungs. This condition is described under DISEASES OF THE LUNG, and BRONCHITIS should also be referred to. When the term "pneumonia" alone is employed, and especially in everyday usage, lobar-pneumonia is meant, so called because, as a rule, a lobe or large portion of one lung is affected. This form of pneumonia is due to certain definite germs gaining entrance to the lungs when, for any reason, the patient's vitality becomes lowered. These germs may be present, and very commonly are present, in the mouths of perfectly healthy individuals. It is only when the vitality is lowered, through such conditions as exposure to cold and damp, that the organisms gain entrance to the lungs and set up pneumonia. The disease is more frequent in the winter and spring months, when the fluctuations of temperature are greatest. Men suffer from pneumonia much more frequently than women, partly because they lead more exposed lives, partly from their greater tendency to alcoholic habits, which undoubtedly predispose very greatly to attacks of pneumonia. Pneumonia may also follow other fevers, such as typhoid and influenza, and may come on in persons suffering from diabetes, Bright's disease, and various exhausting nervous diseases. As regards age, it is common below ten, and, again, from the thirtieth year of life onwards.

The onset of the attack is generally abrupt, with a feeling of chill, and often distinct rigors or shivering fits. Then the patient complains of severe pain in the side, the pain being generally more constant and much more widely diffused than in the case of pleurisy. The temperature rises rapidly up to about 103° F., and remains high until the crisis of the disease occurs; the pulse is rapid, full, and bounding; the patient's face at first is flushed over the cheeks. There is frequently a little group of blisters on the lips, and the nostrils can be seen dilating with each respiration. The respirations are rapid, the breathing being possibly 50 or 60 times per minute, and there is a short, painful cough. What little sputum is brought up is usually tough, and rusty in colour from the presence of slight traces of blood in it. In severe cases it may become watery and dark-coloured, resembling prune-juice in appearance. The patient generally lies in bed on his back, or turned on the affected side. When the chest is examined, it will be seen that the movement on one side (the affected side) is much less than on the other. The tongue is dirty and dry, and vomiting is a not uncommon symptom at the commencement of an attack. The appetite naturally is lost. Headache is frequently present. In children convulsions may take the place of the rigors which so commonly usher in an attack in adults. A mild degree of delirium is very common in pneumonia, and in alcoholic subjects the delirium may be of a very wild nature. It may be remarked here that cases of delirium tremens with a high temperature should always be suspected to have pneumonia. In them the typical symptoms of pneumonia are frequently absent, the disease passing through its various stages more rapidly than usual, and its presence is apt to be overlooked unless the chest is very carefully examined. About the eighth day of the illness, in favourable cases, the temperature suddenly drops to normal. That is the crisis of the disease, and from this time convalescence begins. The patient's general symptoms and feelings ought to improve with this fall of temperature; if they do not, some complication is probably present. Pneumonia shows a tendency nowadays to depart somewhat from this behaviour in ending by a crisis, and in nearly half of all cases the temperature goes down by lysis—*i.e.* gradually—and the general improvement in symptoms is also more gradual in showing itself. This change in the type of the disease is believed to be largely due to a mixed infection by influenza organisms, as well as those more directly connected with the production of pneumonia. The outlook in pneumonia is serious when the attack occurs in persons at either extreme of life, in alcoholic subjects, and in persons where the attack is, as it were, a last stage of some other serious disease. Grave symptoms are, in any particular case, the appearance of "prune-juice" sputum, a very high temperature (over 105° F.), feeble pulse and heart, and the extension of the inflammation from one lung to the other.

Treatment.—Favourable cases occurring in strong persons may require no medicinal treatment, merely careful nursing and the usual attention to food, which should be entirely fluid, and given in small amounts every two or three hours. The patient naturally must be confined to bed, and ought never to be allowed even to sit up, because the great risk in pneumonia is heart-failure. The doctor's watchword, in fact, in the case of pneumonia, is "Watch the pulse." At the outset of an attack it is always a good practice to give an aperient, such as 2 or 3 grains of calomel in the form of a pill, followed, if necessary, by a Seidlitz powder the next morning. If there is much pain, the chest may be poulticed, or a jacket lined with wood-wool applied. In some instances an ice-bag will be found to give more relief than a poultice, but this should only be applied if the heart is quite strong. Sleeplessness is often troublesome for the first few days of an attack of pneumonia, and some form of sleeping-draught is frequently necessary; but the ordering of this ought to be left to the doctor in charge of the case. Stimulants such as alcohol, strychnine, ammonia, and heart tonics like digitalis, are frequently necessary, but it is a good rule never to use them too early in the attack. It is much better to keep them in reserve until the last few days, when they may become really necessary if the heart shows signs of failing, and then they may have to be pushed vigorously. This is particularly the case in individuals who have been free users of alcohol, but in that case it may be necessary to give alcoholic stimulants from the outset of the attack. The dosage of stimulant necessary will naturally vary with each individual, but as some guide one might just say that from 2 to 8 ounces of whisky or brandy per diem, given somewhat diluted in small amounts fairly frequently, may be necessary. If the patient's temperature rises very high, or if there is much delirium, sponging with cold or tepid water may be employed with safety and advantage. When the crisis occurs, it is particularly necessary that the patient's room is kept warm, and to have stimulants at hand in case of sudden collapse occurring, because with the fall of temperature the heart loses the stimulus it received from the warm blood. The most quickly acting stimulant is sal volatile, of which a teaspoonful may be given in a little water. This collapse with the coming of the crisis is particularly apt to occur in old people. The use of inhalations of oxygen is often recommended during the later stages of the attack. During convalescence care is still required not to throw too great a strain upon the heart, particularly in old and weakly persons, and if there has been any influenzal element about the attack. There are numerous complications of pneumonia, one of the commonest being pleurisy and empyæma. There is always a certain amount of dry pleurisy along with pneumonia, but empyæma is to be feared when the temperature does not go down properly to normal within a few days of the eighth day of the attack. (See under PLEURISY.) Other less frequent complications are pericarditis and acute valvular affections of the heart. Meningitis sometimes occurs with pneumonia, and acute inflammations of various joints may occur. Within the lung itself abscess and gangrene occasionally occur, and, should pneumonia affect a person who was previously consumptive, the tubercular process is apt to light up and become much more serious after the pneumonia is recovered from.

Pneumothorax.—This means the presence of air or gas in the chest, and in many cases it is associated also with the presence of fluid. The condition may result from a perforating wound of the chest wall or from laceration of the lung by a broken rib. Another cause may be the rupture of cavities in the lung into the pleural cavity of the chest. When air enters the chest cavity, the pressure within the chest and within the lung on the affected side is equalised, and the lung collapses. The result is that the patient suddenly becomes very breathless. He frequently becomes blue in the face, with a feeble and rapid pulse, and, as a rule, severe pain in the chest is complained of. On examination of the chest the affected side will be seen to be distended and immobile, and on tapping it gives a tympanitic sound like striking a drum. In the case of pneumothorax due to a perforating wound or laceration of the lung by a rib, recovery is likely to occur so long as there is no infection of the pleural cavity by germs. The air becomes absorbed, and the lung gradually re-expands. On the other hand, where the condition is due to cavities in the lung rupturing into the chest, there is likely to ensue a condition of empyæma (see under PLEURISY and EMPYÆMA), and the condition is often a very serious or even dangerous one.

Treatment.—In the first two classes of case the condition is best left alone, the patient keeping at perfect rest in a recumbent attitude. The air acts as a splint, and allows the rent in the pleural membrane to become rapidly repaired, after which the air soon becomes absorbed. In cases where there is fluid or pus in addition to the air, the treatment must be simply that for empyæma. (See above.)

Podagra.—An old name still sometimes applied to gout affecting the foot. (See GOUT.)

Poliomyelitis is the name given to an acute inflammatory condition affecting the grey matter of the spinal cord. It is the same disease more commonly known under the name of infantile paralysis, and, for a description of the disease and the paralysis it brings on, see under PARALYSIS.

Polyneuritis.—See *Multiple Neuritis*, under NERVES, DISEASES OF THE.

Polypus.—Polypus is the name applied to almost any form of growth or tumour which is attached by a narrow stalk to the surface from which it springs. Most polypi are of a non-dangerous form. The three situations in which the polypi are most commonly found are the nose, the rectum, and the interior of the womb. (For further description see under NOSE, DISEASES OF THE; RECTUM AND ANUS, DISEASES OF THE; and under WOMEN, DISEASES PECULIAR TO.)

"Port-wine Stains."—See BIRTH-MARKS.

Pott's Disease.—This is the name frequently used in connection with the angular curvature of the spine resulting from tubercular disease of the spine. (See under SPINE, DISEASES OF THE.)

Pregnancy, Complications of, and Special Affections associated with.—The pregnant woman is liable to suffer from practically any disease which may affect her at other times, and occasionally special treatment may be necessary on account of her pregnant condition, but we propose here to deal only with those affections peculiar to pregnancy or symptoms specially associated with it.

One of the most serious forms of abnormal pregnancy which may occur is that known as *extra-uterine pregnancy*, in which the child develops not within the interior of the womb, but within the small, narrow Fallopian tube leading from the ovary to the womb. This, fortunately, is not a common condition. Most cases occur in women over thirty, and in those who have already borne children. The only suggestive symptoms of its occurrence in the earliest stages of pregnancy are irregular losses of blood, possibly the discharge of shreds of membrane, and abdominal pain. The development may go on with little or no trouble for two or three months, and then there is every likelihood of the sac within which the child is developing rupturing, with the death of the mother either through internal hæmorrhage or subsequent peritonitis. This is likely to happen within the first four months of pregnancy. In a very few cases the pregnancy may go to full time. The symptoms accompanying the rupture are those of intense collapse, the patient becoming suddenly deadly pale, and the pulse becoming almost imperceptible; there is generally some abdominal pain, but it is not necessarily very severe. If the loss of blood is not of itself sufficient to cause death from shock and anæmia, and the patient is unable to obtain treatment, the fatal issue is generally only postponed for a few days, within which time peritonitis is almost certain to develop.

Treatment.—If the condition is diagnosed before rupture—which, unfortunately, can only very seldom be the case owing to the slightness and uncertainty of the symptoms—the patient should be operated on, and the tube and its contents removed through the abdominal wall. When—as is most commonly the case—the condition is only recognised by rupture occurring, removal and the arrest of hæmorrhage by operation is still more urgently called for, as being practically the only method of saving the patient's life. In those few cases which go to full time, the child cannot be delivered by the normal route, and, if not born by Cæsarian section (opening the abdomen), usually dies, and there is also very great risk to the mother.

Excessive Morning Sickness.—A certain amount of nausea and sickness, especially in the morning, is recognised as one of the commonest and earliest signs of pregnancy. As a rule this morning sickness commences in the second or third month of pregnancy, and disappears again within a few weeks. Sometimes, however, the nausea is excessive and long-continued, and may even lead to serious results from loss of nutriment, and from the constant distress which it occasions. In the milder cases of obstinate vomiting, one of the most important points to attend to is to see that the bowels are kept thoroughly well opened. After attention has been paid to this, the stomach will require soothing by antacids, such as by the compound bismuth lozenges recommended under Dyspepsia, and in many cases this alone will cure the tendency to excessive vomiting. It is often also advisable that the patient should take a large tumblerful of water before getting up in the morning, and even to induce an attack of vomiting after taking this, because in many instances it will be found that, if this is done, there will be no further trouble during the rest of the day. No general line of dieting can be laid down. When any attempt at swallowing hard food brings on vomiting, it is better to make no pretence at keeping to regular meals, but to take small quantities of light liquid food immediately after an attack of vomiting has occurred. It is frequently observed that the appetite at this stage is fanciful and capricious, and that unusual articles of diet may be retained perfectly well when ordinary foods are rejected. In these cases the only sensible thing to do is to let the patient have whatever she can take. The medicines which have been recommended and tried for allaying excessive vomiting are numerous, and it may be necessary to try one after another before a satisfactory one is found in any particular case. In addition to the bismuth lozenges recommended above, other drugs occasionally found useful are dilute hydrocyanic acid, from 3 to 6 drops being taken in a little water after each meal, vinum ipecacuanha in single-drop doses every hour, and oxalate of cerium, 3 to 5-grain pills thrice daily. A measure sometimes found very satisfactory is the application of an ice-bag to the back of the neck, applied for half an hour or so several times a day. In a few intractable cases, when all treatment fails, it may be necessary to bring on abortion artificially, and so terminate the pregnancy to save the mother's life.

Other diseases of the digestive system frequently give rise to considerable discomfort, although not to the serious condition which may attend obstinate vomiting. Amongst these are especially *acidity* and *heartburn*, and occasionally capricious appetite, assuming the form of cravings for curious and even disgusting articles of food. The acidity and heartburn is best treated by bicarbonate of soda, which may be taken freely after meals, whenever heartburn and flatulency are complained of, throughout the whole of pregnancy. *Constipation* is a very general accompaniment of pregnancy, even in those who do not suffer from it at other times. It depends very largely upon the mechanical pressure of the womb interfering with the movements of the intestines. The diet should be so selected as to contain a good quantity of fluid, and also such articles as fresh and stewed fruits, brown bread, oatmeal porridge, or other articles containing a considerable quantity of residue, which acts as a stimulant to the sluggish bowel. Some medicinal treatment is almost always necessary. A small quantity of aperient mineral water may be taken first thing every morning, and at night, if required, a teaspoonful of compound liquorice powder, one or two compound sulphur lozenges, or a pill containing 2 grains of dried ox-gall. One of these or some mild aperient will be found both safe and sufficient to counteract the constipation and its ill-effects. Castor oil is quite good if only taken occasionally, but not for regular use, because of its after-effect in actually causing costiveness. Strong purgatives and aperients should be avoided owing to their liability to cause abortion in women who have any tendency that way, although it may be said that enormous doses are required in most cases to cause miscarriage, except in those persons in whom such condition is liable to occur from almost any slight cause. Towards the end of pregnancy the irritation caused by masses of hard stools accumulating in the lower part of the bowel is the commonest cause of the false pains which so frequently trouble patients. For this castor oil or hot-water enemata are advisable. The prevention of constipation is also the most effective method of lessening the congestion of the veins, which so commonly leads to the development of piles during pregnancy.

Toothache and Decaying Teeth.—There is no doubt that pregnancy does predispose to the decay of the teeth, much of it probably due to the acidity of the stomach; so that we have here another important reason for counteracting the acidity by the free use of antacids, such as bismuth and bicarbonate of soda. There is a great deal of unreasonable dread of interfering with the teeth during pregnancy, many persons going the length even of recommending that teeth should never be pulled or even stopped; but this dread is utterly without basis, and badly decayed teeth should be extracted and less severely affected ones stopped, as only beneficial results follow such procedure, while the opposite is likely to be the case if the operation is postponed until after delivery.

Eclampsia.—This condition, which may occur either during pregnancy or after delivery, is an exceedingly serious one, and it is a condition whose presence ought to be recognised before definite symptoms of it show themselves. This can only be done by having the urine regularly examined, and a monthly, or, better, a fortnightly, examination of the urine should be carried out in the case of every pregnant woman from the sixth month onwards until delivery. If this is done, the development of serious disease can usually be anticipated and checked. The chief symptoms of eclampsia when developed are dropsy, so that any puffiness about the face should give rise to suspicion; also headaches, paralysis, and convulsions. Before definite paralysis or convulsions appear, the patient will probably complain of dizziness, spots before the eyes, sleeplessness, and irritability of temper. The urine may be noted to be very scanty and high-coloured, and, on heating to boiling-point, it turns almost solid. Should this serious condition be suspected, medical aid must be obtained without delay, because the disease may be an exceedingly serious one both for the mother and the child. Indeed, in many cases it is necessary to induce premature labour to save the mother's life at all, although in milder cases light liquid diet and purgation may allow the pregnancy to go on until full time; but even then the danger is not always past, because similar fits may come on after delivery.

Chorea, or *St. Vitus's dance*, occasionally comes on as the result of pregnancy, seldom, however, except in persons who have previously suffered from the disease in childhood. The disease is apt to assume a very severe type, but the treatment does not differ from that of the disease under ordinary circumstances. (See CHOREA.)

Varicose veins are exceedingly apt to develop during pregnancy, especially after several pregnancies, and this condition, of course, tends to persist. It is not possible, however, to apply any special treatment during the pregnancy; all that can be done then is for the patient to rest as much as possible and to use an abdominal belt, which supports the womb and takes its pressure off the veins running up from the legs. If the veins of the legs are much swollen, a certain amount of benefit will be derived from the use of well-fitting elastic stockings or bandages carefully applied from the feet upwards. (For further treatment see under VEINS, DISEASES OF.)

The membranes within which the child develops in the womb are subject to one or two diseased conditions. The watery fluid in which the child floats may be present in excessive amount, and give rise to discharges of a clear watery fluid at intervals during pregnancy, but especially in the later months. Beyond the discomfort caused by this condition, and the fact that mistakes are frequently made in believing the discharge to indicate rupture of the membranes and commencement of labour, this excess of fluid need not give rise to any anxiety. The pregnancy generally progresses to the full period. No treatment is necessary, nor is there any which has the least effect in controlling the discharge.

The developing membranes and child sometimes undergo a curious form of degeneration into what is known as *hydatid* or *vesicular mole*—*i.e.* the formation of numerous small bladder-like bodies, resembling a bunch of white currants or small grapes. The cause of this degeneration is not known, but, once it has commenced, the diseased tissue may grow until it forms a mass several pounds in weight. The first symptom is generally that the womb grows in size more rapidly than it ought to do at a corresponding period of normal pregnancy, and, usually about the third or fourth month, there will be some painful discharge of blood-stained fluid, and sooner or later some of the characteristic bladder-like structures will be discharged, and then only can the definite diagnosis be made. As soon as the diagnosis is made, the womb ought to be cleared of its contents, and the sooner this is done the better. Operation under chloroform is necessary for this. If this be not performed, the growth may remain for months or years, giving rise to pain and discharges from time to time.

Abortion.—For consideration of abortion or miscarriage see under ABORTION.

Presbyopia, or Old Sight.—See under EYES, DISEASES OF THE.

Prickly heat is a condition to which European residents in warm or tropical countries are particularly liable, but an analogous condition is not uncommonly met with in more temperate climates during the summer months. The condition is associated with excessive sweating, especially when suddenly induced by exertion, and it consists in the development of numerous tiny red pimples, which go on in a very short time to the formation of small vesicles or blisters. It is exceedingly itchy, and, if recurrent, may pave the way for a widespread attack of eczema. The irritation and the itchiness will in most cases soon disappear if the skin be liberally drenched with some such mild antiseptic dusting powder as powdered talc, containing 3 per cent. of powdered salicylic acid.

Progressive Muscular Atrophy.—See under PARALYSIS.

Prolapse is the term used to describe the sinking down of some organ or structure from its normal position. The term is used chiefly in connection with downward displacements of the lower end of the bowel and of the womb. For further description the reader is referred to RECTUM AND ANUS, DISEASES OF THE, and under the heading WOMEN, DISEASES PECULIAR TO.

Prostate Gland, Diseases of the.—See under BLADDER, DISEASES OF THE.

Proudflesh.—This is the name popularly applied to healing surfaces, such as those of cuts or ulcers, where the repairing tissue becomes too prominent, and overlaps the skin which is growing inwards from the sides of the wound or ulcer to cover it over. In such cases it is necessary to check the too rapid growth, and this is best done by slightly touching the proudflesh for a second or two with a moistened crystal of sulphate of copper or bluestone.

Prurigo.—A disease of the skin in which there is excessive itching; but, in addition to this, the skin shows small reddish spots, which at first give rise to a sensation, when the hand is passed over them, as if one were stroking a nutmeg-grater. Owing to the scratching which is almost sure to be indulged in, the spots may become covered with scabs, but there is seldom any moistness or weeping of the surface as in eczema. The limbs are the parts of the body most frequently affected, and the disease is one which commences in childhood, becomes worse as the child grows, and, as a rule, lasts for life, even in spite of treatment. Ordinary urticaria or nettle-rash in childhood, if left untreated or if frequently recurring, is apt to develop into this disease, therefore it is important that obstinate cases of nettle-rash in children should be thoroughly treated. We would recommend that patients suffering from prurigo consult some physician with special experience in the treatment of skin diseases, otherwise efforts at treatment are more likely to do harm than good.

Pruritus means simply itching, a symptom which is common to many diseases of the skin, but the term should be limited to those in which there are no appearances of any actual disease of the skin other than those that may be produced secondarily by scratching. There are numerous internal and constitutional diseases which may be responsible for itchiness of the skin, and careful examination by a physician will frequently reveal some such definite cause, and, if this can be removed or cured, the itchiness will disappear. But in a certain number of cases no definite reason for the itchiness can be found, and in these the only treatment that can be adopted is for the relief of the itching. Even in cases where there is some definite cause for this symptom, while recovery or cure is being effected it is frequently necessary to use some remedy for the relief of the itching itself. There are numerous remedies which have a repute for relieving itching, and several of those are referred to under the heading ITCHING. Warm baths are often efficacious, although, unfortunately, they do not always improve the state of the skin where the itchiness is due to some definite skin disease. Carbolic acid, in the strength of a teaspoonful of the pure acid to half a pint of water, applied as a lotion, soaked on pieces of lint or simply bathing the part with the lotion, is one of the most generally useful remedies. In cases where no definite disease can be discovered, electrical applications, especially that form known as "high frequency currents," are often found satisfactory in relieving the itch, or even in completely curing it. (See also under ITCHING.)

Pseudo-hypertrophic Paralysis.—See under MUSCLES, DISEASES OF THE.

Psilosis.—Another name for sprue. (See SPRUE.)

Psoriasis.—See under SKIN DISEASES.

Puerperal Fever.—See under LABOUR, COMPLICATIONS OF.

Pulmonary Diseases.—See LUNGS, DISEASES OF THE.

Purpura means the occurrence of hæmorrhages under the skin, such hæmorrhages appearing as bright- or dark-red spots in the skin in the form of a rash, but distinguished from the ordinary rash of fevers by the fact that, when the spot is pressed on by the finger, it does not temporarily fade out, as does ordinary fever rashes. These purpuric hæmorrhages are due to some poison circulating in the blood, and, as they may occur under many different circumstances, purpura must be regarded simply as a symptom, and not as a definite disease in itself. Rheumatism is perhaps the commonest cause of purpura, but purpuric spots and rashes may occur in severe types of almost any fever. The name "spotted fever," sometimes applied to cerebro-spinal meningitis, is derived from the fact that purpuric spots or hæmorrhages into the skin are of comparatively common occurrence in that disease. Purpura also occurs in some of the more serious blood diseases, such as pernicious anæmia; and certain more definite poisons, such as phosphorus, quinine in large amounts, and the poison of snake venom, may cause severe forms of purpura.

In rheumatism the commonest site of the purpura rash is on the front of the legs, where repeated crops of the spots may occur, and with the appearance of these spots there is usually some fever, sore throat, aching in the back and limbs, and general feeling of being out of sorts. A very severe, but happily rare, form of purpura is occasionally met with in children, in which, in addition to the spots in the skin, there are marked abdominal symptoms, such as vomiting, colic, and hæmorrhage from the bowel. The diagnosis of purpura is easy, the fact that the spots do not disappear on pressure diagnosing it practically from all ordinary skin rashes; but it is by no means always such an easy matter to determine the causes of the hæmorrhages.

Treatment.—The patient should be confined to bed, and, seeing that most cases are rheumatic in origin, it is usually safe to commence treatment with one of the salicylate group of drugs. In an adult, 20 to 30 grains of salicylate of soda may be taken, dissolved in water, twice or three times daily; in the case of a child, 5 to 10 grains may be given. Ten to twenty drops of purified oil of turpentine in capsules is another remedy which is often very satisfactory in checking the development of purpura. If these remedies do not quickly lead to the cessation of the appearance of the spots, and in any case where there are severe symptoms other than the mere appearance of hæmorrhages in the skin, the doctor should be sent for at once.

Pyæmia means a form of blood-poisoning, in which small abscesses or collections of pus break out in various parts of the body. (See BLOOD-POISONING.)

Pylorus, Diseases of the.—Affections of the pylorus, or opening from the stomach into the bowel, are described under STOMACH.

Pyorrhœa Alveolaris.—A condition affecting the teeth and gums, in which the teeth tend to get somewhat loose in their sockets, and there is constant pouring out of purulent matter from between the teeth and gums. Attention by the dentist is most necessary, as the condition may cause severe anæmia and ill-health.

Quartan ague means that form of ague in which the attacks appear at regular intervals, with two clear days between each attack. (See under MALARIA.)

Quinsy is another name for acute inflammation of the tonsils, especially that form in which abscess formation occurs. (See THROAT, AFFECTIONS OF THE.)

Quotidian ague is the name sometimes applied to that form of ague in which attacks occur regularly every day. (See MALARIA.)

Rabies is the same disease in animals which in man we call hydrophobia. (See HYDROPHOBIA.)

Rachitis is another name for rickets. (See RICKETS.)

Rag-sorter's Disease.—See ANTHRAX.

Railway Spine.—This term used to be applied to the condition of general collapse and breakdown in health apt to occur after the shock and jarring occurring from such severe accidents as railway collisions, but also met with in persons who have experienced much less severe injuries. The condition is now recognised as being in many cases simply one of nervous breakdown or neurasthenia, and only in very rare instances due to any gross injury either to the spine or to the spinal cord. The symptoms and treatment do not differ in any essential particular from those of neurasthenia due to exhaustion or other disease. Monetary compensation from the railway company is frequently one of the best cures, and, in cases where a law-suit for compensation is pending, it is practically hopeless to expect any recovery until the suit is settled one way or the other, preferably favourably to the patient. (See NEURASTHENIA.)

Ranula.—The name given to a little swelling which may appear under the tongue from blockage of one of the ducts of the salivary glands. (See under MOUTH, DISEASES OF THE.)

Rashes.—See ERUPTIONS.

Raynaud's Disease.—This disease is one affecting the fingers and toes, and, more rarely, such parts as the nose and ears. The disease takes the form of definite attacks, between which there are no symptoms, and each attack may be divided into two, or sometimes into three, stages. In the first stage the parts affected become white, waxy-looking, and perfectly bloodless, and they are usually quite numb, or may tingle slightly. This stage may last from a few minutes to several hours, and, when it passes off, it is succeeded by a condition of lividity or deep blueness. In this stage there is generally marked tingling, and sometimes even agonising pain. In a few cases, where the circulation has not been sufficiently early re-established, or where the attacks have been very frequently repeated, a third stage may ensue—namely, that of local gangrene, the parts becoming dry, mortifying, and dropping off. The condition is due to a spasm of the blood-vessels of the part, the exciting cause of the spasm being very commonly exposure to cold, especially when associated with a condition of great fatigue. Not infrequently Raynaud's disease is associated with other nervous diseases. The condition is undoubtedly commoner in women than in men, and there is sometimes a tendency for it to run in families. Another not uncommon association is with paroxysmal hæmoglobinuria, the exposure to cold bringing on both an attack of Raynaud's disease and the appearance of blood pigment in the urine. The main treatment consists in prevention by keeping the hands and feet always well wrapped up and warm. To relieve the spasm of the blood-vessels, persons liable to attacks may take some such medicine as nitrite of soda.

℞ Nitrite of sodium	48 grains
Water	6 ounces

Dissolve. Take a teaspoonful of this twice or thrice daily.

Another method of improving the tone of the vessels locally is to have the hands and feet immersed in water through which a weak galvanic current is being passed. For the pain associated with the second stage of the attacks, probably the best remedy is to have some Goulard's lead lotion applied to the affected parts. (See GANGRENE.)

Rectum and Anus, Diseases of the.—The anus may be absent or imperfectly developed in children at the time of their birth. Such a malformation, if not remedied, must cause death within a few days from obstruction of the bowels; but, even where operation is attempted, it is not always successful, because in many cases there are present other abnormalities which render life impossible. Still, where it is discovered after the birth of a child that some such malformation is present, the attempt at a remedial operation must be made.

Ischio-recto Abscess.—This means an abscess surrounding the lower part of the bowel. It may be of an acute nature or chronic, in which case it is practically always tuberculous in nature, and usually a complication of tuberculosis in some other part of the body, such as the bowels or lungs. The symptoms of an abscess in this situation are in nowise different from those of abscesses generally (see ABSCESS), but they have a special importance, because, if not treated properly, they are apt to end in the condition known as fistula-in-ano.

Fistula-in-ano.—This term is applied to all those conditions in which chronic discharging openings are found in the neighbourhood of the anus and the lower end of the rectum. Some are blind openings, opening on to the skin externally, or into the bowel internally. Others are thoroughfares communicating both with the bowel internally and with the exterior through the skin. There is a more or less constant discharge of matter from these openings, and, since the contents of the bowel usually have free entrance into the fistula, healing may be indefinitely prevented, the patient remains in constant discomfort, and his general health may suffer considerably. The treatment both of ischio-recto abscess and fistula-in-ano must be surgical, the parts being freely laid open, cleaned, and allowed to heal only from the bottom of the wound. (See FISTULA.)

Itching around the anal opening is frequently a troublesome and sometimes very distressing complaint. In children it is most commonly due to the presence of thread-worms, and, if these are expelled from the bowel, the itching will soon cease. (See under PARASITES.) In older people it may be due also to worms, or to some evident complaint, such as piles, polypi, or fissures. In such conditions the itching is usually worse when the patient is warm in bed, and there may be a considerable degree of actual pain after movement of the bowels. For treatment see under headings of the particular condition responsible for the itching. In old people itching is often a troublesome complaint, without there being any obvious cause for it, and such cases are often exceedingly difficult to cure. (See under ITCHING, and also under PRURITUS.)

Fissures of the Anus.—The formation of a fissure or crack in the skin at the anal opening is most commonly met with in persons whose general health is bad, particularly in those who have long resided in warm countries. It is occasionally due to injury, or to the presence of a polypus just inside the opening, but more often it is due to the passage of hard lumps in patients suffering from chronic constipation. The pain caused by movement of the bowels is so great that the patient refrains as much as possible from going to stool, and, once the condition is established, a vicious circle is formed, and without radical treatment a cure cannot be effected. The pain set up by movement of the bowels is of a burning character, and may radiate down the thighs or up the back, and lasts for hours after movement. In early cases healing may be brought about by attention to the patient's general health; by regulating the action of the bowels by constant use of laxatives, such as cascara or castor oil; and by the use of suppositories containing some substance, such as morphia or cocaine, which deadens the pain. But in the majority of cases it is necessary to have the fissure (or ulcer which may form over it) cauterised or otherwise treated to induce it to heal. It is generally advisable, at the same time, to have the condition of the lower part of the bowel investigated, in case there may be a polypus present, which, if undetected, would soon cause a recurrence of the mischief.

Prolapse of the Bowel.—Prolapse or protrusion of the bowel is a common complaint, especially in weakly children. The condition is readily recognised from the presence of a projecting soft red swelling after movement of the bowels. In the earlier stages of the condition the prolapsed bowel can easily be replaced by a little pressure, but it returns if the patient strains or coughs. Where the condition has been allowed to last long, the replacement becomes increasingly difficult, and the prolapsed bowel is apt to become inflamed and constantly painful, and it may even become strangulated, with serious results. The immediate cause of prolapse of the bowel may be very slight. Any irritable condition about the anus, such as piles, chronic constipation or diarrhœa, the presence of worms, or irritation in neighbouring organs, such as the bladder, may lead to frequent straining, and thus bring about the condition of protrusion of the bowel. In the slighter cases, especially in children, the prolapsed bowel ought to be washed with lukewarm water every time it comes down, particularly after movement of the bowels, and the projecting portion should then be returned by steady pressure with a sponge wrung out in cold water. If the bowel tends to come down when the child is running about, it will be necessary to wear a pad supported by a suitable bandage or strap. To prevent constipation and undue straining, mild laxatives may be necessary, and it is often advisable for the bowels to be opened with the child lying on one side instead of sitting up. Astringent injections may be employed, such as a solution of sulphate of iron in the strength of from 1 to 3 grains to an ounce of water, about an ounce of this lotion being injected by a small syringe night and morning. Naturally, also, the general health of the child should be attended to, and if there is any obvious condition, such as worms or irritation from neighbouring organs, that must be attended to. The great hope of obtaining a cure in this way consists in never allowing the prolapse to remain down for any length of time. Where the protruded part is large, and especially in adults, it is probably much quicker, and undoubtedly more certain, to have the condition put right by operation, although the measures mentioned above will naturally be tried first.

Tumours.—Polypi of the rectum occur most commonly in children, and present an appearance something like that of a small cherry with a long stalk projecting out from the anus. They do not, as a rule, cause much pain, but there is a constant feeling of irritation, a discharge of blood, and a tendency to the development of fissures or prolapse. A natural cure is sometimes effected by rupture of the stalk of the polypus. This will generally be accompanied by considerable hæmorrhage, but may otherwise be quite satisfactory. A very simple little operation, however, is all that is necessary for the removal of these growths.

Cancer about the anus is fairly common. It commences growth on the skin, just at the margin of the opening, and starts as a small hard nodule, which very soon ulcerates. The only treatment is early and thorough removal by operation. Cancer within the rectum is also fairly common. This form commences very insidiously, and the symptoms may be so slight that no suspicion is raised of the presence of any growth until it has attained considerable size. It occurs chiefly in persons of middle life or over. It leads at first to alternating attacks of constipation and diarrhœa, and to the discharge of large quantities of slimy mucus, often blood-stained, and in many cases it is thought by the individual to be simply piles. There develops a sense of weight or dragging in the bowel, and, after movement of the bowels, the patient still feels as if there was something there to come away. The stools may be observed to be flattened or very small, and like a pipe-stem in appearance. A definite diagnosis can only be made by examination of the bowel. If removal of the growth is impossible by operation, the condition is inevitably fatal, usually within two years of its onset. Even where removal is not possible, however, some relief may be obtained by the formation of an artificial anus through an opening into the bowel in the left groin. The stools are then discharged at this point into a suitable receptacle worn by the patient, and are thus prevented from passing over and irritating the tumour, and in this way the patient's life may be prolonged considerably, and a great deal of suffering prevented.

For other conditions connected with the rectum and anus see CONSTIPATION, DIARRHŒA, PILES, and STOOLS, ABNORMAL CHARACTERS OF THE.

Relapsing Fever.—This disease, as the name indicates, is characterised by an attack of fever which lasts about a week, followed by a period of approximately the same length in which the fever is absent, and then again by a recurrence of feverishness. These alternating periods may be repeated several times. The disease is now known to be due to a specific germ, and it is one which is practically only found in persons living in dirty surroundings, with an insufficiency of air, and bad food supply. It occurs in all parts of the world, but in this country it is now very rarely seen except in some districts of the west of Ireland. Persons of either sex and of any age may be affected. The disease is contagious, and there is little doubt but that the infection is frequently spread by the bites of insects which have previously bitten patients suffering from relapsing fever. The symptoms come on suddenly about a week after exposure to infection, with shivering, headache, pains in the limbs, vomiting, and sometimes jaundice. The temperature rises high, usually to about 105° F. or 106° F., and it is maintained about this height for nearly a week, when it falls rapidly to normal, or even below normal. The subsequent feverish attacks are similar in nature to the original seizure, but after the second one the others are usually milder. There is seldom any rash or other characteristic symptom, but the patient becomes extremely weak by the end of the attack. Recovery is, however, the general rule, only a few cases being fatal. There is no special treatment for relapsing fever. The feeding must be carried out on the lines indicated under the treatment of fever generally. (See FEVER.) If the patient becomes very feeble, stimulants may have to be used freely. Although the temperature tends to rise so high, good results do not follow in this disease from the use of cold baths or other methods of bringing down the temperature, and their use is not therefore to be recommended.

Refraction, Errors of.—See under EYES, DISEASES OF THE.

Relaxed Throat.—See under THROAT, AFFECTIONS OF THE.

Remittent Fever.—A type of fever in which the fever and associated symptoms diminish in severity from time to time, but do not actually disappear. This type of fever may occur in several diseases, but the term is frequently used as synonymous with a particularly severe type of malarial fever. (See under FEVER and under MALARIA.)

Renal Diseases.—See KIDNEYS, DISEASES OF THE.

Retching.—See VOMITING.

Retention of Urine.—See under BLADDER, DISEASES OF THE.

Rheumatism is a disease taking many different forms, or perhaps we should rather say that several diseases, probably really quite distinct from each other, are included under the general term rheumatism, and it will be necessary to describe these separately.

1. *Acute Rheumatism*, or, as it is very commonly called, *Rheumatic Fever.*—This is an acute feverish illness, characterised specially by inflammation of various joints and by profuse sweating, the sweat having a characteristic sour odour. Acute rheumatism is now generally agreed to be due to germs, possibly to more than one special variety of them. It is a disease which occurs chiefly in temperate climates, rarely in the tropics or in cold, dry countries. It is distinctly commoner in the wetter months of the year, and frequently comes on after chills and fatigue or exposure. It may occur at any age, but a very large proportion of cases occur between the ages of ten and thirty, and more frequently in males than in females. It is worthy of note that persons with red hair and light complexions seem to suffer from acute rheumatic affections to a greater extent than others. The question of heredity is rather an undecided one. There is little doubt that a tendency to the more chronic forms of rheumatism does run in certain families, but it is questionable if this applies equally to acute rheumatic infection. In the majority of cases the infection probably gains access to the system through the tonsils, acute inflammations of which are very frequently of a rheumatic nature. The old theories that rheumatism is due to excess of lactic acid or of uric acid in the system may be regarded as exploded; any excess of these bodies there may be is undoubtedly a result and not a cause of acute rheumatism. The symptoms may be fairly sudden in their onset. Not infrequently they are more gradual, with a general feeling of malaise, slight sore throat, and pains in the joints. The joint pain generally commences in one or more of the larger joints of the limbs, not, as a rule, in the small joints of the hands or feet. The affected joint is swollen and acutely inflamed, so that any movement or touch causes extreme pain. The skin over the joint is dusky red in colour, and of a somewhat sodden appearance, and much hotter to the touch than the surrounding parts. After the development of a swollen joint the patient's temperature rises, generally to about 102° F. or 103° F. One very characteristic feature of acute rheumatism is the speedy spread of the inflammation to joints other than those first affected. In fact, if one joint alone remains affected, it is almost certain that the inflammation is not due to acute rheumatism, but is an acute arthritis from some other kind of inflammation. The other most characteristic symptom is the profuse sweating, which breaks out in paroxysms and has a peculiar sour smell. The tongue is coated, the urine scanty and high-coloured, the severity of the pain keeps the patient from sleeping, and he soon becomes exhausted and anæmic. Aching of the back, tenderness of the scalp, and reddish rashes (espe-

cially on the front of the legs), are other features which are not infrequent. This acute stage, if untreated, lasts, as a rule, from eight to ten days. The most serious complication of acute rheumatism is the spread of the inflammation to the heart, setting up either acute pericarditis, or, more commonly, and also more seriously, acute endocarditis, resulting in valvular disease of the heart. This will usually occur within the first week, but the symptoms in the early stages are absent, or, at most, a slight breathlessness is present, and the condition is one for which the physician has always to be on the watch. Another more immediately dangerous complication is that of hyperpyrexia, in which the patient's temperature rises up to 106° F. or more, and death may occur. More rarely meningitis or pneumonia may complicate rheumatic fever. The only difficulty in the diagnosis lies in separating acute rheumatism from other forms of acute infections of joints, especially those forms of multiple joint inflammation which may follow scarlet fever, typhoid fever, or after an attack of gonorrhœa. The spread of the inflammation from one joint to another, accompanied by diminution of the inflammation in the joint first affected when another becomes involved, is one of the most distinctive features of true acute rheumatism; but sometimes the real cause is only made out when treatment of the case on lines proper to acute rheumatism proves to be a failure.

Treatment.—The patient should be kept in bed between blankets, and wearing flannel night-clothes. Immediately the condition is recognised he should have a large dose of salicylate of soda, say 20 grains dissolved in water, every four hours for the first day or two. This will be found to reduce the pain and to bring down the temperature within that time, after which the administration may go down to three times a day, at which it should stand until the temperature has been normal for at least a week. If necessary, aperients should be given at the commencement of the attack, preferably a 2- or 3-grain blue pill at night, followed by a Seidlitz powder next morning. The affected joints should be kept wrapped up in cotton-wool, and may be anointed under it with an ointment composed of equal parts of ichthyol and lanoline, or, in very painful cases, a teaspoonful of oil of wintergreen may be soaked into a little gauze, which is spread over the joint and covered with oiled silk. These applications should be changed night and morning. Occasionally it is an advantage to apply splints in order to diminish the twitchings of the muscles, which move the joints and cause considerable pain. The pain in the joints is usually severe enough to make the patient quite content to remain in bed, but it is most unwise to attempt to get up and return to business the moment the pain disappears. Nothing is more calculated to bring about a relapse and to set up valvular disease than to get about before the rheumatic poison has entirely disappeared. The old maxim of at least six weeks in bed for an attack of rheumatic fever is one which still holds good. The diet in cases of rheumatic fever should be entirely a liquid one, so long as there is any rise of the temperature or any swollen joints, and copious draughts of barley-water and aerated waters should be taken by the patient. It is generally advisable to add a little bicarbonate of soda or of potash to some of the liquid taken by the patient. To diminish the tendency to heart complications it is a common practice to have several small fly-blisters applied over the heart. One or two about a quarter of an inch in diameter may be applied daily, distributing them over the region between the collar-bone and the nipple on the left side. It is naturally advisable that the patient's heart be regularly examined by his doctor, and it cannot be too strongly impressed that the patient who insists upon getting up and going about as soon as he feels well is taking his life in his hands.

Acute rheumatism does not always assume the form of definite rheumatic fever; this is especially the case in children, in whom the disease may run a much less acute course, the symptoms, in fact, not infrequently passing almost unnoticed, and they may only be recalled when it is found too late that valvular disease of the heart has developed. The same may occur, although less commonly, with adults. The pain and swelling of the joints may be very slight, and are frequently dismissed or ignored as being simply "growing pains." There are no such things as "growing pains," and, in the great majority of cases, what are described as such are really indications of a mild attack of rheumatism. Repeated attacks of this may result in just as serious heart disease in children as a definite attack of rheumatic fever.

It must be borne in mind that tonsilitis is, in many cases, definitely rheumatic in nature, also that some red rashes (see *Erythema*, under SKIN DISEASES), and the hæmorrhagic rashes in the skin known as purpura, are in many cases evidence of rheumatism, and require as such to be treated with the same degree of caution, especially in children, because serious heart mischief may ensue if the rheumatic nature of the condition is not recognised. The treatment is exactly the same as that for rheumatic fever, although it is not usually necessary for the confinement to bed to be so prolonged.

Another manifestation of acute rheumatism, only found in children, is the appearance of small, rounded, hard swellings about the size of peas just under the skin. They are not, as a rule, tender or painful, but may indicate the presence of rheumatism affecting the heart valves. It should also be borne in mind that, in all probability, chorea or St. Vitus' dance is a manifestation of rheumatism, and in this case also it may be combined with heart affection. It is always necessary for a person who has had an attack of acute rheumatism to guard particularly against chills, and to wear a sufficiency of warm clothing.

2. *Chronic Rheumatism.*—This may result from a recurrent series of slight attacks of acute rheumatism in the joints, or it may be chronic from the onset. It usually attacks persons after middle life, and especially those whose occupation has exposed them to much cold and damp. The chief symptoms complained of are stiffness and inability to move the joints, these symptoms being more prominent when rainy weather is threatening. The joints become somewhat swollen; there is crackling on movement, and a little pain, especially on sudden movement, and this pain may shift

from joint to joint. The best treatment for this condition can undoubtedly be carried out at some of the various baths and hydropathics, particularly those where there are sulphur springs; but, where such treatment is not available, much may be done at home, even if complete cure is not obtained. In cases where there are attacks of inflammation, with occasional swelling and redness of the joints, rest and salicylates should be given, as in the case of acute rheumatism; but in the commoner and more chronic forms alkalies, such as 20 to 30 grains of bicarbonate of soda given in a tumblerful of water twice or thrice daily, will be found more useful. Another combination of drugs found very serviceable in those cases is that which goes by the name of the Chelsea Pensioner. Its composition is as follows:

℞ Sulphur	6 parts
Mustard	6 parts
Guaiac resin	3 parts
Rhubarb	1½ parts
Nitre	1½ parts

Treacle sufficient to make an electuary.

Of this a dessert-spoonful should be taken at night.

Locally the joints should be kept warm with woollen coverings or special wrappings of wood-wool. If they are very painful, they may be painted with tincture of iodine occasionally, or rubbed several times daily with an ointment composed of one drachm each of salicylate of methyl and menthol, mixed with one ounce of lanoline. Turkish baths, or the Turkish bath cabinets which may be used at home, may be taken once or twice weekly, with considerable advantage, in most cases of chronic rheumatism.

3. *Rheumatoid Arthritis.*—This condition, sometimes also known as *rheumatic gout* or as *poor man's gout*, is probably neither gout nor rheumatism, nor yet a combination of these two, but a definite disease by itself, which, however, it is not always easy to distinguish from chronic rheumatism, although it is important that the distinction should be made in order that treatment may be satisfactory. This disease assumes several forms, the simplest being the occurrence of small bony knobs at the side of the finger-joints. These are not painful, but they lead to stiffness of the joints, and frequently to deflection of the fingers to the thumb side. In other cases a single large joint, such as the shoulder, hip, or knee, may be affected. This form is particularly apt to come on in old people after some injury which may be comparatively slight. It leads to pain, especially at night, stiffness and restricted movement at the joint affected, and to wasting of the muscles over the joint. The third, and probably the commonest, form is that in which a number of joints are affected. As a rule those of the fingers and hands are the first affected, then the feet, and from these it spreads towards the trunk. The condition begins with pains in the joint, worst at night, swelling of the finger-joints, enlargement of the knuckles, and the hand takes up a deformed position, being usually pulled over to the side away from the thumb. In the foot there is swelling about the ankle, and a tendency to development of flat-foot. At all the affected joints there is some creaking on movement. The disease may spread and involve the spine, keeping it fixed and immovable, usually in a bent position, so that the patient is kept permanently with a bent back, and the jaw-joint may be so involved that it is almost impossible to open the mouth. With these changes in the joints there is generally wasting of the muscles and an extraordinary tendency to sweating in the hands and feet, and very commonly the development of a kind of freckling, orange-brown coloured spots appearing on the skin of the arms, and sometimes also on the forehead. The cause of this disease is not very definitely known. Sometimes it comes on almost acutely, so as to resemble an infectious or inflammatory process; more often it comes on slowly and gradually, in debilitated persons who have been exposed to prolonged exertion with insufficient rest and food, or too much worry or mental strain, or to the exhaustion which may result from too frequent or prolonged nursing. It is also not uncommon after attacks of influenza, and in families with consumptive tendencies, although the actual patient is not necessarily consumptive. Women suffer about three times as commonly as men, and the affection, as a rule, comes on somewhere between the ages of forty and fifty. The treatment is sometimes fairly satisfactory, especially in the acuter stages, if the condition is recognised early. The diet ought to be as rich and as generous a one as can be digested, including a considerable amount of meat and an allowance of some good sound wine or stout, and extracts of malt. The medicines employed in treating gout and rheumatism are of no service. Probably the best drug for this condition is the syrup of the iodide of iron, given in teaspoonful doses thrice daily after meals. Cod-liver oil along with extract of malt, or separately, is also useful. The affected joints should not be rested too much—in fact, it is advisable that they should be moved and used as much as possible, just short of producing fatigue. If the patient can be removed to a warm, sunny climate it is undoubtedly a great advantage, and, even if remaining in this country, a change to a dry inland spot will generally be helpful. Moist seaside places are probably the worst possible for this disease. Hot-air baths are the most satisfactory local application for relieving the pain and stiffness. If these cannot be obtained, ordinary sea-sand should be heated in a tin in the oven and poured over the affected joint, as hot as can be borne, for several minutes night and morning. Another method of treatment which frequently does wonders, even in cases where there is marked restriction of movement and deformity of the limbs, consists in the application of large blisters over the spine, these blisters being kept open for a week or ten days after they are produced. It is rather a heroic mode of treatment, and can only be adopted where the patient's heart and kidneys are sound, and even then it is usually necessary to give some opiate during the cure, but the results are so gratifying in many cases as to warrant a trial even in seemingly hopeless cases. Naturally, for a severe method of treatment such as this, the patient must be under a doctor's observation.

4. *Muscular rheumatism* is a disease differing from all the other forms of rheumatism described in that it affects the muscles and not the joints. It may affect muscles in various parts of the body,

giving rise to pain and stiffness. One of the parts most commonly and most severely affected is the group of muscles in the small of the back, occasioning the disease commonly known as lumbago. For further description of this condition, which will apply in general to rheumatism as it affects any other muscle, see under LUMBAGO.

Rheumatoid Arthritis.—See previous page.

Rhinitis means inflammation of the nose. (See under NOSE, DISEASES OF THE.)

Rickets.—A disease of children, in which there is softening, and imperfect formation, of bone, with numerous symptoms consequent on these. The cause of rickets is not perfectly clear, but two main factors seem to be responsible—one, deficiency in the diet, particularly in the amount of fats; and, secondly, bad hygienic surroundings, with little fresh air and sunshine. Probably in many cases these two factors are both present. Rickets is also influenced in its occurrence by climatic conditions. It is commonest in cold and damp regions, and is much more prevalent in cities than in the country. It is a disease which usually shows itself within the first six months of life, and it rarely begins after the age of two. The symptoms may be divided into those which are directly due to changes in the bones, and into general constitutional symptoms.

1. *Changes in Bones.*—The head of a rickety child tends to become large, and square in outline, but flat on the top. The bones of the skull become thin—so thin, indeed, that they will sometimes crackle under the fingers, especially the bone at the back of the head. The fontanelle, or diamond-shaped space which pulsates near the front of the head, is always late in closing. In a healthy child this space ought to be closed by bone by the eighteenth month, but, if closure is delayed beyond two years, rickets should always be suspected. The teeth appear late in rickets, the first teeth sometimes not appearing until the child is a year or a year and a half old, and, when they do come, they are frequently imperfect and readily decay. The chest shows signs of rickets usually later than the skull, but they may be present within the first half-year of life. The most characteristic appearance is the development of a row of bead-like prominences down the front of both sides of the chest at the junctions of the ribs with the cartilages which unite the ribs to the breastbone. This is the so-called "rickety rosary." Owing to the softness of the ribs the chest wall often sinks in, giving rise to a groove running down at either side of the breastbone, which may project as pigeon breast. The haunch bone and bones of the pelvis are also soft, and tend to become deformed, although this is not usually noticed during childhood; but the changes produced here may have very serious results later on in life in women, if pregnancy occurs.

One of the places where rickety changes in the bones may earliest be observed is at the wrists, the bones there becoming swollen. This change may be noticed within a month or two of birth, and similar swellings may be seen just about the ankle-joint. The leg bones often yield and become bent, especially in children who are crawling or attempting to walk. Thus such deformities as knock-knee or bow-legs may be brought about, and in other cases the shin-bones become curved from behind forwards, almost like a sickle. As a direct result of these changes in the bones, a child with rickets is unusually quiet and disinclined to move, because there is distinct pain in the limbs on movement. The child shows none of the usual restlessness of the healthy infant, and, when picked up or moved, cries, and evidently suffers pain.

2. *Constitutional Symptoms.*—Rickety children are generally nervous, restless at night, and very readily have general fits or convulsions, or localised fits, taking the form of cramps in the hands and feet (tetany). Even more characteristic is the tendency to suffer from attacks of spasmodic croup. They always have a tendency to bronchial catarrh, and are seldom free from colds. Should any serious attack of bronchitis or pneumonia occur, rickety children are peculiarly unable to resist it. Gastric catarrh and diarrhœa are also very common. Sweating at night, especially about the head, is another practically constant feature of rickets. Some rickety children are thin and emaciated; others, whose diet may be plentiful but of the wrong kind, especially those brought up on artificial foods, may be plump and yet be markedly rickety.

Rickets, if untreated, tends to cure itself by about the third or fourth year of life, but, if allowed to persist so long, permanent deformities of some of the bones are sure to result. On the other hand, where the child's surroundings can be made favourable and the disease has not been allowed to advance too far, there is good reason to hope for a perfect cure.

Treatment.—Attention must be paid, in the first instance, to the child's hygienic surroundings. It ought to have a sufficiency of warm clothing, and be kept clean. It should be kept day and night in a well-ventilated, pure atmosphere, and should stay out of doors in the sunlight as far as can be managed. Regarding the diet, whether the child is being breast-fed or is on artificial foods, it will be necessary to add fat in some form to its dietary; cream is one of the most readily available and suitable means of administration. For a child under a year old a dessertspoonful of cream should be added to its usual bottle of milk three or four times a day. For older children, correspondingly larger amounts may be given. Medicinally cod-liver oil, and phosphorus in some form or other, are the two most useful remedies. The cod-liver oil should be given in the form of emulsion, a teaspoonful or more being given thrice daily. The phosphorus is frequently given in the form of oil of phosphorus, one drop being added to each teaspoonful of the cod-liver oil emulsion. Yolk of egg is another valuable food and medicine, since it contains both fat and phosphorus. Other remedies frequently employed are salts of iron and of lime, since there is frequently a deficiency of lime salts in the dietary. A favourite prescription which contains most of those medicines is the following:

℞ Cod-liver oil	1 ounce
Syrup of lacto-phosphate of lime	1 ounce
Hypo-phosphite of soda	24 grains
Mucilage of gum acacia	3 drachms
Oil of cassia	3 drops
Lime water	to 3 ounces

A teaspoonful of this to be taken thrice daily after meals.

Deformities of the limbs should be prevented by not allowing the child to walk, or even to crawl, until the acuter symptoms have been definitely got rid of. At a later date it is sometimes necessary to have deformities rectified by operation.

There is another disease or form of rickets which may conveniently be described here—the disease sometimes known as *scurvy rickets,* since it is somewhat intermediate in its character between scurvy and rickets. Whilst ordinary rickets occurs chiefly in children of the poorer classes, scurvy rickets is most commonly seen amongst children of well-to-do parents; it is practically certainly caused by absence of fresh food from the dietary. Children who are fed mainly or entirely upon patent foods or prepared foods are very liable to suffer from this condition. The prolonged use of boiled or sterilised milk is also sufficient to bring about scurvy rickets in children, and even pasteurised milk is not absolutely safe in this respect, although it is not so risky as boiled milk. This form of rickets usually comes on at a somewhat later period than ordinary rickets—*i.e.* somewhere between the eighth and fifteenth month. After this time, when the diet becomes more varied and fresh foods are being taken, there is little risk of its occurrence. The chief symptoms are fretfulness, wasting, and marked disinclination to move the limbs, and on examination it will be found that the limbs are swollen and tender. The child becomes anæmic, its complexion taking on a peculiar earthy hue; hæmorrhages are sometimes seen under the skin, as in true scurvy. If the child has teeth, the gums will become red and spongy, and will bleed at the slightest touch; but if the teeth have not appeared this will not be seen. Once the condition is recognised, treatment is very simple. It is merely necessary to add some fresh articles to the dietary, such as the juice of half an orange given in small amounts throughout the day, or grape-juice, or the juice obtained by squeezing raw meat. Improvement sets in within two or three days with this treatment, and the child rapidly attains perfect health.

Rigors, or Shivering Fits.—These usually indicate some chill, and, if prolonged and accompanied by rise of temperature, are frequently indicative of the onset of some acute feverish condition. The precautions which should be observed are the same as those described under CHILL.

Ringworm.—See under SKIN DISEASES.

Rock fever is a local name for the fever more commonly known as Mediterranean fever or Malta fever. (See MALTA FEVER.)

Rodent Ulcer.—This is the name given to a chronic form of ulceration usually met with in persons over forty, and seen most commonly on the face about the corner of the mouth, nose, or eye, or more rarely in other situations. It commences as a small hard nodule in the skin, surrounded by a reddish zone. After some time it breaks down in the centre, forming an ulcer with a smooth surface surrounded by a hard, slightly-raised, rolled-over edge. It is quite painless, and the patient's general health does not suffer, at least in the early stages. But it is important that the real nature of the condition should be recognised. It is undoubtedly a form of cancer commencing in the glands of the skin, and although it is not a very malignant type, being slow in its growth and not tending to give rise to secondary growths of cancer in other parts of the body, if left untreated too long it extends wider and wider, destroying the tissues it advances into. The old method of treatment was by the knife, cutting wide of the ulceration, but nowadays these cases are found to be readily and completely curable by exposure to X-rays, or radium.

Rosacea, or, as it used to be called, *acne rosacea,* is a condition affecting chiefly the nose, and is described under NOSE, DISEASES OF THE.

Rose, or St. Anthony's Fire. — Old names for erysipelas. (See ERYSIPELAS.)

Rötheln, Rubella, or **Roseola** are other names for German measles. (See GERMAN MEASLES.)

Round Worms.—See under PARASITES.

Rubeola.—Another name for measles. (See MEASLES.)

Rupia.—The name sometimes applied to the formation of a rash or crust upon the skin, looking like limpet shells. In the majority of cases these are due to syphilis (*q.v.*).

Rupture.—See HERNIA.

St. Anthony's Fire.—See ERYSIPELAS.

St. Vitus' Dance.—See CHOREA.

Salivary Glands, Affections of the.—See PAROTID GLAND, AFFECTIONS OF, and MOUTH, DISEASES OF THE.

Salpingitis means inflammation within the Fallopian tubes. (See under WOMEN, DISEASES PECULIAR TO.)

Sand is the name occasionally used in connection with deposits in the urine. (See under BLADDER, DISEASES OF THE; also GRAVEL.)

Sand-fleas, or Jiggers.—See under PARASITES.

Sapræmia is a name applied to a mild form of blood-poisoning. (See BLOOD-POISONING.)

Sarcoma.—A form of tumour, which is described under the general heading CANCER.

Scabies.—See ITCH.

Scalp, Diseases of the.—The scalp is liable to be the seat of many of the diseases which affect the skin generally, and most of these are described under SKIN DISEASES, and also under such special headings as BALDNESS. For the treatment of parasitic affections of the scalp, such as the presence of lice, see under PARASITES. Wounds and injuries of the scalp do not differ in their treatment essentially from wounds elsewhere, but it is particularly important that wounds in this part should be kept clean by antiseptics, owing to the risk of infection extending through the skull and setting up meningitis. It is usually advisable to have the hair closely cut or shaved round any wound in the scalp before having it cleaned and sewn up.

Erysipelas is another infective condition which is readily set up as a result of injuries to the scalp, especially if they are not kept clean, and if the person is one whose tendencies are at all alcoholic. (For treatment see ERYSIPELAS.)

Tumours or *growths* are not very uncommon on the scalp. Some of these are pulsating in their character, and may be composed of bunches of dilated blood-vessels, or they may even be due to projections of the brain through defective portions of the skull. These can only be treated, if at all, by surgical means. Of other non-pulsating tumours, warty growths may occur, especially about places on which the hat rests. These are readily removable—in fact, they may be snipped off with scissors—but in order to prevent their recurrence it is advisable to have the spot from which they have been removed touched with lunar caustic.

Small soft *cysts*, or *wens*, are also common on the scalp—in fact more common here than on any other part of the body. (See Wens.)

Scarlatina, or Scarlet Fever.—This is an acute infectious fever, its most characteristic symptoms being sore throat and the occurrence of a very bright-red rash over almost the whole of the body, followed later by marked peeling of the skin. Second attacks of scarlet fever are very rare. The disease is one which is commonest in childhood, particularly between the ages of five and ten. It is one which occurs in temperate climates chiefly, and in this country it is most common in late autumn and early spring. As a rule it occurs in regular epidemics, but isolated cases not infrequently crop up in places where epidemics have previously existed. The disease is almost certainly due to germs, but, although it is so common, the particular organism causing it has not yet been definitely identified. The infection is very commonly conveyed through the medium of milk, the milk becoming infected either from a milker who has been suffering from the disease, or possibly in some instances direct from the cows, which suffer from a disease of the udders supposed to be the same disease in them as scarlet fever is in human beings. Infection may also be spread by the skin which is cast off in the convalescent stages, and if this becomes attached to clothes, bedding, or furniture, it retains its virulence for a long period, and may set up scarlet fever in others, if they handle the material, even years afterwards. Naturally, of course, infection may also be spread by coming into close contact with some one suffering from the disease at any period of the attack.

Symptoms.—There is a period of from one to ten days after exposure to infection during which there are no symptoms. For about one day the patient suffers from general malaise, headache, vomiting, and sore throat, with a temperature rising to about 102° F. or 104° F. If the throat is examined at this stage, it will be seen to be very red, and the tonsils are swollen and painful. On the second day, as a rule, small bright-red spots appear, first of all on the neck and chest, and from there rapidly spreading over the whole body. Between these very bright-red and slightly-raised spots the whole of the skin shows a general reddish hue. Practically the only parts which escape, as a rule, are the scalp and round about the mouth. The skin over many of the joints is often swollen and stiff, and the face may also be swollen. The appearance of the tongue is very characteristic. At first it is covered with a white fur, through which shine bright-red points, giving it the so-called "white strawberry" appearance. About the third or fourth day the fur disappears, and the tongue then presents, and keeps for about a fortnight, the red strawberry appearance—*i.e.* general redness, with still more markedly red raised spots. The temperature remains high until the rash begins to fade, which it generally does about the third or fourth day, although sometimes it may be as late as the tenth. So long as the rash is out the throat remains inflamed, swollen, and painful, and sometimes it is covered with a membrane not unlike that present in diphtheria. It must be remembered, however, that diphtheria and scarlet fever may be, and fairly commonly are, present together. As the rash disappears the temperature gradually comes down, and the skin begins to peel. The peeling of the skin lasts for two to three weeks, or even longer. In children and in persons with greasy skins the peeling may be very slight, looking simply like powder on the skin, and in other cases the skin may come off in large flakes, leaving a sort of worm-eaten appearance on the skin where they come off. Complications of scarlet fever are not uncommon. Inflammation of the valves of the heart, leading to definite valvular disease, may occur. In children pleurisy and empyæma are common. Middle-ear disease is another complication which may lead to long-lasting running ears, and may cause meningitis from extension through the base of the skull to the brain. During convalescence, and usually as a result of exposure to cold, the condition most to be feared is the onset of acute Bright's disease. This may follow on even a very mild attack of scarlet fever. The first symptom of such an attack is generally a little puffiness below the eyes, and the urine presents a smoky appearance from the presence of blood in it. Although scarlet fever is a disease which is much dreaded, and which must be regarded as one of the serious complaints of childhood, nevertheless it is not so dangerous as measles or whooping-cough, which cause more fatalities from the frequency with which inflammation of the lungs occurs in conjunction with them. At the present time the type of scarlet fever prevalent in this country is an exceedingly mild one—so mild, indeed, that the rash is often very, very slight, and the condition may not be recognised until the typical peeling begins.

In the treatment of scarlet fever it is essential that the patient should be completely isolated, and, if not removed to a fever hospital, should be put in a room as far as possible away from the rest of the house, and from which all unnecessary furniture and hangings have been removed. The rest of the family should not immediately be sent away from home. They must, indeed, be looked upon with suspicion, and be kept in quarantine for a period of ten days, by which time it will be certain whether or not they also are taking the disease. The sick-room should be kept well warmed, but also well ventilated and aired. The diet during the feverish stage should consist largely of milk and beef-tea, but aerated waters and juicy fruits may be freely permitted. The patient should be sponged daily, or even more frequently, with tepid water. When the skin commences to peel, the spread of the flakes should be checked by rubbing the body all over with weak carbolated oil, or with vaseline containing some eucalyptus oil. While the throat is inflamed and painful, it should be treated with some antiseptic, either in the form of a gargle or a douche, the latter being preferable for young children, who cannot be expected to gargle their throat properly. One of the best gargles is chlorine water, prepared by pouring half a teaspoonful of dilute hydrochloric acid over one drachm of chlorate of potash. Gradually add five ounces of cold water to this. Mix with an equal amount of hot water, and irrigate the throat with this, either by means of a douche-can and tube or with a syringe and long nozzle. Condy's fluid is sometimes used for the same purpose, also glycerine and carbolic acid, but these are not so satisfactory as the mixture prescribed. Sometimes the throat, and especially the tonsils, become exceedingly swollen and boggy-like, indicating the formation of an abscess. In this case, the abscess ought to be opened as early as possible. In cases of badly swollen throat the patient may be unable to swallow, and it becomes necessary to feed him by means of a tube passed through the nose. When the temperature commences to fall and the rash to fade, the patient may go on to light puddings, and perhaps even fish, but no heavier diet should be given for three or four weeks, until all risk of acute Bright's disease is past. Whenever peeling commences the patient must be kept warmly clad, and, when allowed up, must be careful not to be exposed to cold. The urine ought to be examined every few days, so as to be on the look-out for any evidence of inflammation in the kidneys, and watch should also be kept on the ears for running from them, especially in cases where the throat has been very bad. For the treatment of running ears see under Ear, Diseases of the. In cases where the infection is very virulent, the patient may become very collapsed, when free stimulation by alcohol is necessary. Patients after scarlet fever should not be allowed about until peeling has completely vanished, which is seldom under six weeks; and it need hardly be said that the clothes and bedding of a scarlet-fever patient, and the room in which he has been, require very thorough disinfection.

Sciatica.—This may be either a neuralgia or a neuritis affecting the large sciatic nerve running down the back of the thigh. It is very common in men, especially over the age of thirty, and more particularly in persons with gouty or rheumatic tendencies. It may come on from exposure to cold or damp, and also from injury, such as prolonged pressure from a badly-fitting bicycle saddle, or even from sitting on hard benches, and sometimes it is due to the pressure of growths about the haunch bone or within the pelvis, or of some other diseased condition around the hip-joint. In persons with sciatica on both sides, the possibility of it being due to diabetes must be kept in mind, whilst another error sometimes made is to mistake the shooting pains of early locomotor ataxia for sciatica. The chief symptom is pain along the line of the nerve at the back of the thigh, particularly when the leg is in any position which puts a strain on the nerve. Thus it may be painful when sitting, or when the leg is forcibly bent at the hip-joint with the knee kept straight. The pain is, as a rule, only absent when the person is lying down. There are often points tender to pressure at the back of the hip, behind the knee, behind the prominence of bone on the outer side of the leg just below the knee-joint, and also at the outer side of the ankle behind the prominence of bone there. The pain may be continuous, or it may come in paroxysms. Cramp and tingling feeling are experienced at the back of the thigh. In obstinate, long-standing cases the muscles of the leg may waste considerably. Sciatica, as a rule, can be cured fairly easily, but recurrences are common, and in severe cases it may take months to effect a cure.

Treatment.—Where there is any definite diseased condition, such as diabetes, or any tumour pressing on the nerve, the treatment must naturally be directed towards the removal of this. In cases where gout or rheumatism are present, the patient ought to receive special remedies appropriate to those conditions—either colchicum or salicylates. (See Gout and Rheumatism.) Local treatment, however, is practically always necessary. If the case is at all severe, the patient must be kept in bed, and the leg given as complete rest as possible, and it may be necessary to apply a long splint right from the armpit to the heel to secure this. The limb should be kept warm by wrapping it in cotton-wool and by lying on rubber hot-water bottles, the knee being kept slightly more elevated than the rest of the limb by means of a cushion. Blisters are frequently applied along the line of the nerve at the back of the thigh. In severe cases more vigorous measures may have to be used, and probably the best of those is to have a number of needles inserted into the course of the sciatic nerve, this being done, of course, under strictly antiseptic precautions. In other cases, injections of various substances into the nerve are employed, chiefly with the object of breaking down the adhesions which form around it as a result of the chronic inflammatory condition which constitutes neuritis. In milder cases electricity and baths of various kinds, especially peat baths, will often give excellent results. Massage is also of use at times, but should not be employed during the acuter stages, when there is much pain. In a very few extremely bad cases operation may be necessary, either to stretch the nerve or actually to remove a portion of it, where the pain is unbearable and it has resisted all other methods of treatment.

Scissor Legs.—See under Paralysis, and also under Gait, Peculiarities of.

Scoliosis, or Lateral Curvature of the Spine.—See under Spine, Diseases of the.

Scrofula, or Struma.—These are old terms used for a condition of constitutional weakness and liability to suffer from various affections of the skin, bones, joints, and other parts, all of which are now known to be definitely due to tuberculosis, and the terms may be regarded as synonymous with tuberculosis or a tubercular constitution. (See Tuberculosis; also under Glands, Affections of.)

Scrotum and Testicles, Affections of the.—1. *Congenital Malposition.* The testicles develop within the abdomen, but before birth they should have descended into the scrotum, passing along a canal which sometimes remains open and allows at the same time the descent of bowel, constituting a congenital hernia or rupture, and which at all times is a place of weakness where a rupture may occur. (See Hernia.) Occasionally one or both testicles do not descend, but remain either within the abdomen or stick half-way in the canal. The condition is easily recognised by the absence of the testicle in the scrotum; whilst in the case where it sticks in the canal, there will be a small movable swelling about the size of a bean in one or other groin, giving the characteristic sickening sensation which the testicle gives on pressure. A late descent of such a testicle sometimes occurs, almost always accompanied by a hernia. Although not in their proper position, such testicles are usually quite capable of carrying out their functions. In the case where they are completely retained within the abdomen nothing can be, or requires to be, done. Where one or both are retained in the canal, partially descended, they are very liable to knocks and other injuries, also to attacks of inflammation, and in later life to become the source of a cancerous growth. Taking such risks and discomfort into consideration, there is little doubt that a testicle in such a position is better removed by operation early in life; if both are so misplaced, however, one at least must be left, otherwise the individual will suffer from all the ill-effects of emasculation.

2. *Injury to the Testicle.*—A blow or squeeze of the testicle is associated with pain of a most sickening and agonising character, often with a degree of shock lasting for some time afterwards, in some instances so severe even as to cause sudden death. Inflammation and subsequent atrophy of the testicle may follow later upon an injury. The treatment consists in keeping the patient lying down for so long as there is any pain or swelling, with the scrotum raised by means of a small pillow, and the application of hot fomentations or a large sponge wrung frequently out of very hot water.

3. *Inflammation of the Testicle.*—This may be acute or chronic, the latter variety being practically always tubercular in nature. Acute inflammation of the testicle—or *orchitis*, as it is called—is characterised by the organ (usually only one is affected, although both may be affected together) becoming enlarged, and exceedingly painful and tender to touch. The pain radiates from the scrotum towards the back and loins. The skin of the scrotum becomes reddened and thickened over the inflamed testicle. The patient's temperature is generally raised several degrees, and there may be vomiting, whilst constipation is generally pronounced. The inflammation but rarely goes on to suppuration with abscess formation; as a rule it simply gradually subsides, but atrophy of the affected testicle is a frequent result. If both are thus affected, it means, of course, that the individual becomes impotent; whilst if it has occurred in a boy before growth is complete, the growth may be affected and other effects of emasculation show themselves. Acute inflammation most commonly comes on after injuries; it also not infrequently occurs as a complication of gonorrhœa by direct spread of the inflammation. (See under VENEREAL DISEASES.) It may follow on mumps or, more rarely, on other fevers, or it may arise spontaneously from no very apparent cause.

Treatment.—During the acute stage the patient must be kept in bed, with the scrotum well supported by a pad or small pillow, and hot fomentations or poultices kept constantly applied. A dose of calomel (2 to 4 grains of blue pill) should be given to commence with, and after that the bowels must be kept moving freely by the use of such purgatives as sulphate of soda or citrate of magnesia, a tablespoonful being given once or twice a day in considerable quantities of water. The diet should be chiefly fluid—milk and milk foods—so long as there is any pain or rise of temperature. As a sedative for the pain, which is often intense, 10 drops of laudanum or of tincture of hyoscyamus may be taken in a little water two or three times daily. When the acute stage is passed, the organ remains enlarged and somewhat tender for a considerable period, and it is then best treated by having strips of lead plaster fastened round the scrotum over it.

Chronic inflammation or tubercular affection of the testicle occurs chiefly in young men with a definitely consumptive or tubercular family history. It may be secondary to tuberculosis in some other part of the body, or the testicle may be the first part affected. Only one testicle is usually involved at first, but the other may become affected at a later date. Occasionally the condition begins acutely, like acute inflammation, but after a week or ten days the pain subsides, although the swelling persists, and then abscesses commence to form. More commonly it comes on slowly, with painless swelling, and when the organ is felt it has a lumpy character, parts being hard and parts soft. The soft parts are breaking-down tissue, which ultimately form abscesses, and may break through the skin of the scrotum and discharge. Treatment can be dismissed very briefly. When tubercular disease of the testicle is recognised, the sooner the organ is removed the better, because otherwise the other testicle is almost certain to become affected, and there is also considerable risk of a spread of the disease to the bladder, and thence to the kidneys.

Syphilis sometimes causes an enlargement of one or of both testicles, resembling tubercular disease in character, such enlargements coming on, it may be, months or even many years after the acquirement of syphilis. Older subjects are therefore generally affected in this case, and the diagnosis of syphilitic affection is readily confirmed by the effects of treatment, the swelling rapidly disappearing under the administration of mercury and iodide of potassium, as for other forms of syphilis. (See under VENEREAL DISEASES.)

4. *Tumours of the Testicle.*—These may occur at almost any age, and are characterised by steady enlargement, without any inconvenience or pain beyond a little discomfort from the increasing size and weight. Some forms of tumour are hard, others comparatively soft; some are of a uniformly rounded or ovular shape, others are nodular. A few are of a non-dangerous character, but the majority belong to the rapidly growing and spreading forms of carcinoma and sarcoma, and the only form of treatment applicable to all is complete removal by operation.

5. *Hydrocele.*—This means an accumulation of watery fluid round the testicle, or the spermatic cord coming away from it. It may occur in infants, but is most commonly seen in middle-aged persons. The reason for the accumulation of fluid is not usually very obvious, but the condition is certainly commonest in those who dwell in hot climates, probably on account of the general lax and pendulous condition of the scrotum and testicles. It appears as a rounded, somewhat

pear-shaped swelling in the scrotum, the stalk of the pear extending for a variable distance along the spermatic cord up into one groin. The tension of the swelling varies with the amount of fluid (the more there is the firmer it becomes), but it is generally quite elastic in feeling, and fluctuation or a wave-like motion can be made out by supporting with one hand behind and tapping with the other in front. In the dark, by holding a light close to the scrotum, the swelling can be seen to be translucent, and the relative position of the testicle to the fluid demonstrated. This test is a most useful one in distinguishing hydrocele from other swellings of a solid nature. In old-standing cases, however, the walls surrounding the fluid may become very thick, and the translucency will in such cases be lost. When the distension is very great, the penis becomes buried in the swelling, almost disappearing from sight, the weight causes considerable dragging pain, and eczema is apt to develop over the surface of the scrotum from the constant trickling of urine over it. Any person with a tendency to hydrocele should wear a suspensory bandage, which keeps the scrotum supported in a small bag, and by this means the accumulation of fluid may be prevented, or kept within such modest limits that no further treatment is necessary. If the accumulation is so large as to cause discomfort, then the fluid will have to be drawn off by tapping with a suitable instrument, with all necessary antiseptic precautions. After removal a suspensory bandage should be used, if it was not being employed before. If, notwithstanding repeated tapping and removal of the fluid, it continues to regather, a further operation may be necessary to finally get rid of the fluid, the cavity in which it accumulates either being obliterated or dissected out altogether.

Hydrocele should not be mistaken for the œdematous or dropsical swelling of the whole scrotum, which may occur along with and as part of a general dropsy. The treatment of this is simply that of dropsy generally. (See DROPSY.) In elephantiasis the scrotum may also attain enormous size from an accumulation of whitish, milky-looking fluid. This may either accompany elephantiasis of the legs or be independent of it. The skin becomes thickened and wart-like, and there will probably be a constant oozing out of lymph through the skin of the scrotum. The only effective treatment in this case is dissecting away a large portion of the scrotum. (See ELEPHANTIASIS.)

6. *Hernia.*—One of the commonest causes of swelling within the scrotum is the presence of a hernia or rupture, with descent of a loop of bowel or some of the abdominal contents into the scrotum through the canal in the groin along which the testicle descends in early life. In this case the swelling will always be in the groin as well as in the scrotum, but it may be reducible—*i.e.* disappear back into the abdomen when the patient lies down—and there will be a distinct impulse conveyed into the swelling when the patient coughs. (For further description and treatment see under HERNIA.)

7. *Varicocele.*—This means a dilated or varicose condition of the veins coming from the testicle. It is met with practically only in young men, and is almost invariably on the left side. It occurs chiefly in individuals with a large lax scrotum, and is not infrequently brought on by masturbation, which induces an unusual flow of blood to the testicles. The swelling is only apparent when the individual is standing; when he lies down it disappears, owing to the veins emptying freely. In the erect posture, if the swelling be felt, it gives to the finger a sensation like a collection of worms within a bag, and can hardly be mistaken for anything else. If the condition is at all marked, it produces a feeling of weight, and pain, sometimes of a severe neuralgic nature, in the testicle. It may cause frequent seminal emissions, and lead ultimately to atrophy of the testicle. In slight cases all that is necessary is to keep the scrotum well supported by constantly wearing a suspensory bandage; the use of cold-water baths or sponging of the parts night and morning; and the prevention of constipation, which tends to accentuate the congestion in the veins. In more marked cases, where there is constant discomfort or pain, or where the individual wishes to enter one of the public services, or where he is going to indulge in any long-continued severe muscular exertion, the distended veins must be removed by operation. The operation is a slight one, and within ten days or a fortnight complete recovery will have occurred.

8. *Affections of the skin of the scrotum* are not uncommon, and from the moistness of this region they generally take the form of a very painful and distressingly itchy form of eczema, the skin being intensely red and swollen, and the whole scrotum often considerably enlarged. Lice are a fairly common cause of this trouble, especially if blue mercurial ointment has been used too vigorously for their destruction, as is sometimes the case. In the tropics a special form of ringworm (Dhobi's itch) often affects this region. (See DHOBI'S ITCH.) More chronic forms are sometimes met with amongst workers in tar or paraffin from the irritation of these substances, also in chimney-sweeps from the irritation of the soot. These cases sometimes go on to cancer. Treat eczema with a soothing zinc and calamine lotion:

℞ Calamine	2 drachms
Oxide of zinc	40 grains
Lime-water	6 drachms
Olive oil	to 2 ounces

Mix. Shake before using. Apply twice daily by smearing over and then wrapping in butter muslin which has also been soaked in the lotion.

but, if severe or of any standing, it will be advisable to get the advice of a doctor, as such cases are often very troublesome to heal.

Scurf, or Dandruff.—See BALDNESS.

Scurvy, or Scorbutus.—This is a disease characterised mainly by the onset of weakness, and by a swollen, spongy condition of the gums, which bleed readily, and by the appearance of hæmorrhages under the skin, generally noticed first of all about the ankles or over the shin bones. The condition is one which is due essentially to a deficiency of fresh articles in the dietary. It used to be exceedingly common on board ship, where neither fresh meat nor vegetables could be obtained, but nowadays it is rare, because fresh food can be carried in refrigerators or in tins, and even if fresh vegetables cannot be obtained, their place is taken by the issue of lime-juice, according to the Board of Trade regulations. A mild or modified form of the disease is sometimes met with in persons living in overcrowded tenements, and amongst those whose dietary consists chiefly of tea and bread. In certain parts of Russia the disease occurs almost in epidemic form, suggesting that it may be due to some infection, although in all probability the deficient sanitation of these parts accounts for its prevalence. The disease comes on insidiously, with debility and increasing weakness and apathy. The complexion becomes sallow, and pains in the limbs are complained of. Then it is noticed that the gums become spongy and bleed readily, and the odour of the breath is very fetid. Hæmorrhages occur first of all as small spots above the ankles, then they may become larger, being seen as big purple patches under the skin, and the calves may become hard and brawny from hæmorrhages into the muscles. From bleeding under the periosteum covering the bones, especially the shin bone, very great pain may be caused. Bleeding may also occur from the nose and from the bowels, and persons quickly become very anæmic, with breathlessness and palpitation on the slightest exertion. If treatment is not instituted before long, death may occur from sheer weakness, or from the onset of pneumonia or of some other complication. A modified form of scurvy, known as infantile scurvy or scurvy rickets, is met with in children whose dietary consists chiefly of patent foods. (See under RICKETS.) If proper treatment can be obtained, and the case has not been allowed to go too far, cure can usually be effected rapidly. The one essential is that the dietary contains some fresh elements, either in the form of meat or vegetables. In very feeble persons raw meat-juice, or scraped or pounded meat, may be given, and fresh vegetables, or the juice of limes or lemons, should be taken, not merely as a beverage but as a medicine, several times a day. The mouth often requires some treatment, such as gargling with Condy's fluid or with a solution of chlorate of potash, 5 or 10 grains to 1 ounce of water; and where the breath is very fetid and the gums bleed profusely, it is advisable to paint the gums occasionally with a little 10 per cent. solution of nitrate of silver. The patient may require to rest in bed for some little time to regain strength, but usually recovery is rapid.

Sea-sickness.—The symptoms of sea-sickness are so common as scarcely to require description, the chief of them being giddiness, nausea, and vomiting. Persons vary very much in their liability to suffer from sea-sickness, some individuals enduring distressing symptoms even on a very short and quiet passage, others scarcely suffering more than slight discomfort even when the vessel is pitching and rolling tremendously. It is generally agreed that pitching movements are more liable to set up sea-sickness than rolling. As a rule, immunity from sea-sickness is acquired by persons who are frequently or constantly at sea, although this is not universal, because some persons suffer for a day or two at the commencement of every voyage, even although their occupation keeps them constantly travelling on board ship. The symptoms in most cases soon cease after the voyage is over, or after the first few days in the course of a long voyage, but in very susceptible individuals the sickness may persist for a considerable time after arrival on shore, or for a lengthy period at sea. The causes of sea-sickness are still under debate, some persons maintaining that it is purely a nervous manifestation, which can be controlled by an effort of will, if a strong enough effort can be but made; but few sufferers from sea-sickness will be found to subscribe to this theory, at all events in its entirety, although there is little doubt that by not giving way to the sensation of sickness when it first comes on, the onset and severity can be mitigated. Another view is that the sickness is due to the rapidly-changing impressions made upon the vision; the efforts made to bring about accommodation of the eyes during the rapid and sudden changes of movement give rise to the nausea and vomiting. That this factor is of some importance is proved by the wearing of a patch over one eye sometimes preventing sea-sickness; but it cannot be the sole cause, since attacks occur in the dark, and also in the case of blind persons. The displacement of the abdominal organs by the rapid movements of vessels may have a little to do with the vomiting, but probably the chief cause is the rapid changes in the circulation of the blood and the inability of the nervous system to become accustomed to them. Persons with an unduly irritable nervous system, not readily adjusting itself to those changes, will naturally tend to suffer most.

Treatment.—Many remedies have been proposed and used in the prevention and treatment of sea-sickness, but it cannot be said that any single one will be found suitable in all cases. Practically all of them depend upon the use of some drug which dulls the sensitiveness of the nervous system, and we will only describe one such method, as being that which is probably most generally satisfactory. The treatment should be really of a preventive nature, and commence some little time before the voyage actually begins. For two or three days previously the patient should take either bromide of potash or bromide of ammonium in 10-grain doses, dissolved in half a tumblerful of water, thrice daily. Then, just before sailing, a cachet containing 10 grains of chloretone should be taken, and the individual should at once lie down with the head low and the eyes closed, taking care at the same time that the body is kept well covered and warm, especially if staying on deck. The chloretone cachets may be repeated several times a day if necessary—*i.e.* if symptoms of sickness are threatening—although it will be found that, when repeating the dose, 5 grains will usually be sufficient. In our experience this drug has certainly proved the most efficacious in preventing sea-sickness, and sometimes even in stopping an attack which is in progress. It will act even if not preceded by the two or three days of bromide treatment, although it does better if the bromides have been employed first. Should this drug not be available, and sickness does come on, the patient should attempt to take some food, such as thin arrowroot or gruel, or even to munch hard biscuits. The taking of some food lessens the feeling of collapse, and makes the constant retching which comes on less severe, by giving the stomach something to contract on and bring up.

Seat-worms.—Another name for thread-worms. (See under PARASITES.)

Sebaceous Cysts.—See WENS.

Seborrhœa.—See under SKIN DISEASES.

Septicæmia.—See BLOOD-POISONING.

Seven-days' Fever.—A fever of short duration, occurring in towns in low-lying districts of India and Ceylon near the sea. It is characterised by sudden onset of feverishness, the temperature rising to anything between 102° F. and 105° F., but the pulse-rate does not rise in anything like the same proportion, a typical feature of this disease. There is some headache and general pains in the limbs, the face is flushed, the eyes red, and there may be a few rose-red spots appear on the limbs. After the first rise of temperature there is often a slight fall for two or three days, then it goes up again, to come gradually down to normal about the end of seven days, when the attack is over. The disease is never a serious one; convalescence is rapid, but recurrences may occur. No special treatment is required other than those mentioned under the heading THREE-DAYS' FEVER.

Shaking palsy is another name for paralysis agitans, which is described under PARALYSIS.

Shingles.—This word, derived from the Latin *cingulum*, "a girdle," is the popular name for the disease technically known as *herpes zoster*, which consists in the appearance, usually after a day or two or burning or prickly feeling in the skin, of a crop of little blisters. These most usually occur distributed in a line running round more or less of one side of the trunk, but occasionally they may appear on the head or on the limbs. There is a little redness round the base of the small blisters. They continue to come out in successive crops for several days after the first lot appears. The eruption of these blisters is usually painless in children, but in adults it may be preceded by exceedingly severe neuralgic pains, and, after the blisters disappear, may be followed by months of neuralgic pain at their site. The blisters, as a rule, dry up in about a week or ten days, small scabs forming; these drop off, and the attack is over, except possibly for the persistent neuralgia. The condition occurs most commonly in persons whose general health is below par, but it may o cur in perfectly healthy individuals. There is considerable evidence to show that this disease is of an acute infectious nature, affecting the nerve supplying that part of the skin on which the eruption appears. Second attacks of shingles practically never occur. It is not in itself a serious or dangerous malady in any way, but its appearance may indicate such a lowered state of vitality that it is frequently dreaded.

Treatment.—For the actual eruption very little is required beyond the application of some dusting powder, such as powdered boracic acid, covering it up with cotton-wool and a bandage to prevent any dirt getting into blisters which may be ruptured. For the accompanying pain, phenacetine in 5- or 10-grain powders several times a day may be employed, and sometimes morphia is required when the pain is excruciatingly severe. For the persistent neuralgia which may follow the attack in elderly people, a prolonged course of tonics may be necessary.

Shock.—By the term *shock* is meant a general depressed condition of the nervous system and of all the functions of the body. It may come on after any severe injury or after operations, or from anything which makes a profound impression on the nervous system. Highly-strung individuals are much more liable to suffer from shock than those built in a coarser mould, who may receive the most severe injuries without showing almost any symptoms of shock. The appearance of a person suffering from shock is one of more or less complete prostration or even insensibility. The heart's action is exceedingly feeble, and the pulse weak, irregular, or even imperceptible. The face is pale, and the brow usually covered with cold sweat. The breathing is slow and shallow, and the body temperature is usually a degree or two below normal. After some time—the length of the period depending upon the severity of the shock—reaction occurs, the pulse becoming stronger and the respiration deeper, the skin warmer, consciousness and muscular power gradually returning. During this stage vomiting not infrequently occurs, and, in cases where the shock has been a severe one, patients during the stage of reaction and for some time afterwards may be in a state of considerable mental irritability. Collapse is a condition very similar to that of shock, but differing in that it comes on gradually instead of suddenly, and is generally preceded by some definite exhausting disease.

Treatment.—In slight cases nothing is necessary beyond resting quietly until the condition passes off. In more severe cases the patient must be kept recumbent, with the head low, and hot bottles and blankets placed round the body. A word of warning must be given here not to place too hot bottles close to the skin of a person suffering from shock, because severe burns are very easily produced in an individual suffering from this condition. A broad bandage or binder should be put tightly round the abdomen, because it has been found that the blood tends to stagnate in the abdominal veins, and by thus compressing the abdomen the circulation is improved. If the patient is able to swallow, some hot coffee, warm tea, or a teaspoonful of sal volatile in a wine-glassful of water may be given. Alcoholic stimulants are not to be recommended owing to their subsequent depressing effects. Further treatment, such as the hypodermic injection of drugs or the intravenous infusion of saline solutions, is frequently necessary, but can only be given by the doctor.

Shortsight.—See under EYE.

Sick Headache.—See MIGRAINE.

Sickness.—See VOMITING.

Siderosis is the term applied to that condition of the lungs caused by the long-continued inhalation of small particles of iron-dust by workers in certain trades. (See under LUNGS, DISEASES OF THE—*Dust Diseases of the Lungs.*)

Singers' Nodes.—See under THROAT, AFFECTIONS OF THE.

Sinuses, Diseases of the.—See under NOSE, AFFECTIONS OF THE.

Skin diseases form a very large and heterogeneous class, and, from the different appearances which the same disease may take on when affecting different parts of the body, or skins of different character, the appearances which they present vary enormously. This renders the description and the recognition of skin diseases exceedingly difficult, except to those who are specialists in this department. The classification and the nomenclature of skin diseases have, for the same reasons, become very complicated, and it will not serve any useful purpose to do more than describe the commoner and more typical affections and their treatment. If the disease cannot be recognised by the sufferer from the following description, the sooner he consults some one specially conversant with skin diseases the better it will be for him, because in almost no other group of diseases of the body are the finer details of treatment of so much importance. For our purpose skin diseases may be classified under the following headings:

1. *Diseases of Sensation.*
2. *Disorders of the Secreting Apparatus.*
3. *Inflammations.*
4. *Diseases of the Hairs.*
5. *Pigmentary Affections.*
6. *Growths originating in the Skin.*

1. Diseases of Sensation.—The most important of these is *itching*, which is a symptom common to many diseases, both amongst those limited to the skin and those of deeper origin. The term *pruritus* is frequently employed for those cases in which there is no obvious cause of the itching. (For further description see under the headings Itching, Pruritus, and Prurigo.)

Loss of sensation, or *anæsthenia*, of the skin is always a symptom of some deeper disease, and generally of one affecting the nervous system.

2. Disorders of the Secreting Apparatus of the Skin.—(*a*) *Of the Sweat Glands.* The chief anomaly which occurs here is *excessive sweating*, which may be either general or localised to some particular part of the body. Foul-smelling perspiration is simply a complication due to the growth of certain organisms, belonging to the group of fungi, in the exuded sweat. Excessive general perspiration is a symptom found in certain diseases, such as consumption and rheumatic fever, and in blood-poisoning, and as such does not, as a rule, require any special treatment. Excessive localised sweating may occur on such parts as the face, hands, feet, and armpits. For the treatment of such forms of perspiration prolonged measures are usually necessary, and some form of local application will be required. Absolute cleanliness in the way of washing and baths is essential; and, secondly, the parts may be either bathed with a 5 per cent. solution of tannin, a 2 per cent. solution of salicylic acid, or, after the application of very hot water on a sponge, the part should be rubbed over with formalin soap, which can be obtained ready prepared from the chemist. A good lather should be made, and must be allowed to dry in. Successful results may also be obtained by bathing the part with a 1 per cent. solution of formalin, but in all cases the treatment requires to be carried out for a considerable period. The most recent method of treatment which has been advocated is the exposure of the affected part to X-rays, which, if properly regulated, destroy the sweat glands; but this method of treatment can only be carried out under very expert hands. Some cases of excessive sweating, especially those which affect only one side of the body, are hysterical in their origin, and can only be cured by treatment directed towards the general condition of hysteria.

(*b*) *Of the Sebaceous Glands, or Fat-secreting Glands, of the Skin.*—Excessive secretion or accumulation of the greasy material secreted by those glands, and mixed with dirt and scales from the skin, is commonly known as *seborrhœa*, which in its most common form is familiar as dandruff of the scalp, and this, in its turn, is the chief cause of baldness. (For further description and treatment see under Baldness.) This disease, however, is not limited to the scalp. From there it tends to spread on to the forehead and behind the ears, over the chest and between the shoulders, and in very severe cases may affect almost the whole body. The character of the eruption on the skin of the body varies somewhat, but is generally of a reddish-yellow colour, and has a greasy appearance. If very chronic, it tends to become more dry and scaly, and is practically indistinguishable from the condition known as psoriasis. (See below, p. 521.) The disease is comparatively easily cured in most cases on the body, although it must be insisted upon that it is almost certain to recur if it be not recognised that the scalp is the origin of the trouble, and long and vigorous measures be directed towards it, as described under Baldness. On the body the parts should be regularly and thoroughly washed with soap and water. On the forehead or behind the ears, or on any part where the eruption is rather moist in character, the best application is that known as Lassar's paste, with the addition to it of 10 grains of salicylic acid per ounce, keeping the parts constantly covered with this. In the more common greasy form an ointment containing 5 per cent. each of sulphur and salicylic acid in vaseline will be found of most service. In the very dry and scaly forms the treatment is the same as for psoriasis.

Acne is an eruption due to an inflammation of the sebaceous glands and hair follicles, seen most commonly on the face, giving rise to "blackheads and pimples." (See Acne; and, for the special form of this, sometimes known as acne rosacea, but more usually now as rosacea, see under Nose, Affections of the, since the condition largely affects the nose, where it is very frequently but often erroneously referred to contemptuously as "grog-blossoms.")

Wens are small cysts caused by blocking of sebaceous ducts. (See Wens.)

3. Inflammatory Affections of the Skin.—This section really includes the majority of the diseases affecting the skin. Eruptions and rashes of various kinds occur, and we will attempt to group these together, as far as possible, according to the predominating character of the inflammation; but it will be necessary in the first place to refer briefly to those eruptions and rashes which are due to definite chemical substances, or to changes in the circulation of the skin. Numerous drugs, if taken in excess, or in specially sensitive individuals, may bring out eruptions whose nature varies considerably, but the possibility of any particular rash being a *drug rash* should always be borne in mind. In such cases, of course, the only treatment necessary is to stop the drug. It is

impossible to give a full list of those drugs or chemical irritants which, either taken internally or acting externally on the skin, may produce an eruption, but the following category includes the chief substances, and may serve to put one on one's guard: arsenic, antipyrin, bromides and iodides (very common, the rash generally being rather like acne), copaiba (given in medicines for gonorrhœa, the rash being suggestive of measles), quinine, and turpentine. The bites or stings of various plants and animals may cause eruptions, generally causing a "nettle-rash." The juices of many plants can set up a very severe dermatitis, or inflammation of the skin. Those perhaps best known are the American poison ivy, poison oak, and poison sumach, all belonging to the rhus family. Another member of this family is that which is used in the preparation of lacquer, and a form of poisoning with skin rashes may come on from the irritation of varnish or lacquer, even in handling dry lacquer goods. The Chinese primrose (a common greenhouse plant in this country) is also very apt to cause a skin rash, even without actual contact with it, while many other flowers, plants, or woods are capable of causing rashes in persons constantly handling them, or specially sensitive. The irritation of the materials used in certain trades may also set up inflammation, limited, however, as a rule, to the hands. Baker's itch is a familiar type of this from flour, but many other trades have similar affections. If a worker so affected cannot change his occupation, it will be advisable for him to avoid washing with water too frequently, so as not to deprive the skin of the lubricant which naturally protects it. One washing at night after work will be sufficient, and the soap must be well removed by running water; then the hands should be covered with strips of cloth, spread with some simple oil or ointment (say olive oil or lard), till morning.

Certain other skin affections are of the character of inflammations, but their manifestations are shown mainly in changes in the circulation in the skin. Since they cause evident appearances in the skin, they are conveniently discussed here.

Purpura, or actual hæmorrhages in the skin, showing up as rounded red spots which do not fade on pressure, is a disease of the blood rather than of the skin. (See PURPURA.)

Urticaria, or *nettle-rash*, appearing as raised wheals, white in the centre with a red border, may be caused by external irritants, such as the stings or bites of various members of the vegetable and animal kingdom, by certain chemicals, or it may be due to internal irritants, such as some drugs and various articles of food, particularly shellfish, and, in children particularly, to the presence of worms in the bowel. (See NETTLE-RASH.)

Erythema, consisting in the appearance of slightly-raised spots and patches of a bright-red colour, is generally a manifestation of rheumatism. Such spots tend to come out in young people, especially on the front of the legs and back of the arms; they are generally accompanied by some feverishness and rise of temperature, and there may be definite pain and swelling in one or more of the joints. Rest and the administration of salicylates, as described under RHEUMATISM, are the essentials in treatment, but it will always be advisable for a doctor to be consulted, in case there be some more serious rheumatic affection of the heart.

Erysipelas is a bright-red affection of the skin resembling erythema, but the swelling is more brawny and of an angrier red colour, there is more fever, and the patient feels distinctly ill. (See ERYSIPELAS.)

The *blueness and coldness* of the hands which accompanies a poor state of the general circulation is only too familiar, and is to be treated by keeping as warm as possible, and by attention to the patient's general health, and, in some cases, by special treatment of the heart. Other affections due to cold are CHILBLAINS, and the still more painful condition known as RAYNAUD'S DISEASE. (See under these two headings.)

Diseases in which the Eruption chiefly takes the Form of Vesicles, Blebs, or Blisters.—This group includes the diseases known as hydroa, pemphigus, herpes, and miliaria or "prickly heat." In *hydroa* there is widespread itching and the sudden eruption of groups of blisters, very often symmetrically arranged on both sides. In *pemphigus* very large blisters form, coming out on skin which previously looked perfectly healthy, not being preceded by any redness. In both conditions the disease tends to recur at intervals. General rest and freedom from worry are two of the most important elements in working a cure, the chief medicinal remedy being arsenic, which may have to be taken over a considerable period, but should only be taken under a doctor's supervision, owing to the risks associated with it. The blebs themselves require little beyond opening, so as to let the clear yellow liquid out, and dressing with some ointment, such as boracic, spread on lint. *Herpes* means the development of a group or groups of small blisters, which dry up in a few days into a scab. A very common site for herpes to occur is about the lips or their immediate neighbourhood. The affection is very apt to be a recurrent one, coming on with a cold, any febrile affection, or when run down in health. The blisters soon pass off, but are rather annoying, and, although they cannot be prevented, may be kept within more moderate limits, and be made less irritating, by frequent bathing with very hot water in their earliest stage, or by having them painted over with collodion or the preparation known as "new skin." A more severe form of herpes, known as *herpes zoster* or *shingles*, is described separately under SHINGLES. *Prickly heat* or *miliaria* consists in the development of small vesicles on the top of little red pimples. (See PRICKLY HEAT.) It is always associated with excessive sweating. A somewhat allied affection, but practically confined to the hands, is the disease known as *cheiropompholyx*, in which things looking like boiled grains of sago come out on the sides of the fingers. Treatment is not always very satisfactory, but the best results are got by a combination of tonics internally (Easton's syrup, Parrish's chemical food, cod-liver oil and malt, &c.), with the application of a dusting powder composed of talc containing 2 per cent. of salicylic acid.

Moist or Catarrhal Inflammations of the Skin.—Practically speaking this means *eczema*, although, as mentioned under that heading, the term eczema is one which is used very vaguely by the general public, and also by many doctors, so as to include almost any skin disease of whose nature they are ignorant. The more chronic forms of it may be scaly, and not moist at all. (See ECZEMA.) The greasy condition of the skin called seborrhœa is described above.

Diseases with a Pustular Eruption—i.e. the formation of pus or matter. One of the commonest of skin troubles falls into this group—viz. *impetigo contagiosa.* As the name indicates, it is contagious, or, as they say in Scotland, "smittel," and it often occurs in epidemics in schools, where, among boys, it sometimes goes by the name of "scrum-pox." It may, however, appear at any age and amongst all classes. The face is probably the commonest situation for the disease to break out, and it must not be forgotten that it is commonly connected with the presence of lice in the head, and the infection is spread about by scratching. The pustules form rapidly and dry up rapidly, so that what is generally observed is the presence of honey-yellow crusts of dried-up matter, which look as if they had been plastered on to the skin. The skin beneath and around will probably be a little reddened. Fortunately the condition is very easily cured. The crusts must first be removed by a boracic starch poultice. This is made by mixing a teaspoonful of boracic acid powder with four tablespoonfuls of cold-water starch (preferably pure wheaten starch) and stirring up into a thick cream with cold water, then adding a pint of boiling water and stirring until it sets into a jelly. Enough to cover the part should then be spread on a piece of linen in a layer about half an inch thick, covered with muslin, and applied. It may be renewed in a few hours, if necessary, to remove all the crusts. After removal the part is dressed with an ointment composed of 5 grains of ammoniated mercury in an ounce of vaseline, which in a day or two should effect a cure.

An aggravated form of this condition is known as *echthyma,* generally seen on the legs of weakly children or insufficiently-fed adults. When the scabs are removed in this instance, actual ulcers may be present beneath them. The local treatment is the same as for ordinary impetigo, but constitutional treatment, especially a sufficiency of good food, is necessary for a permanent cure.

Acne and *boils,* in both of which there is pus formation, are treated of separately under their respective headings.

Sycosis, sometimes called barber's itch, is a condition in which pustules form in the hair follicles of the beard region. It is often attributed to a dirty shave, or infection from a barber's brush or razor. Whether this be the case or not, the condition is a very obstinate one to cure, and one which shows no natural inclination to disappear of its own accord. The moustache is less commonly affected than the chin and cheeks. Shaving is often very difficult, and short clipping has often to be resorted to. Antiseptic ointments, X-rays, and other forms of treatment have been tried, and any one of these may be successful, but the use of a vaccine prepared from the organisms, which can always be cultivated artificially from the discharge, gives probably the best results. Somewhat prolonged treatment, however, is generally necessary, and the sooner a person affected with this complaint gets it seen to the better. Sometimes there is considerable difficulty in distinguishing between this affection and ringworm of the beard, even by experts.

Other diseases with pustular skin affections, although they are not specially skin diseases, are anthrax, glanders, actinomycosis, and yaws. *Anthrax* occurs chiefly in persons dealing with cattle, wool, or hides. When it commences on the skin it appears first as an itching red spot; a bleb forms, which soon forms a black liquifying centre, with round about a wreath of smaller blisters. *Glanders* occurs almost entirely in persons working amongst horses, and on the skin it tends to develop as an ulcer on the face or hands. In *actinomycosis* the discharge characteristically contains yellowish granules. *Yaws* is only met with in the tropics. (See under these headings.)

Diseases with a Papular or Pimply Eruption.—The chief member of this group is *lichen planus,* which is characterised by the development of a large number of small pimples with rather angular outlines, determined by the fine lines of the skin. They are of a lilac tinge, and with a shiny or burnished surface. Any part of the body may be affected, but specially, as a rule, the front of the wrists, the back of the neck, and the inside of the thighs just above the knees. The patient's general health is seldom affected. The eruption will probably last for some months, even under treatment. In chronic cases the papules tend to run together, and have a scaly appearance not unlike psoriasis. (See below.) Even when the eruption disappears it leaves behind some brown pigmentation, especially on the legs, and the longer the condition has lasted the deeper will this be. The best treatment seems to be the administration internally of corrosive sublimate in small doses, but as a poisonous substance this can only be obtained on a doctor's prescription. On the eruption itself the following ointment should be spread frequently:

℞ Carbolic acid	15 minims
Corrosive sublimate	2 grains
Zinc ointment	1 ounce.

Diseases with a Scaly Eruption.—Psoriasis. This disease is very characteristic, and its rounded red patches and rings, covered with dry silvery scales, can scarcely be mistaken for anything else. If the scales are not easily made out, they will be made more evident by lightly scratching with the nail. It affects persons of all ages, but mainly young adults. The front of the legs and back of the arms are usually the parts most affected, and in many cases the scalp will be found to be the seat of a seborrhœa (dandruff), so that some authorities regard this disease as merely a very dry variety of seborrhœa (*q.v.*). The disease is one in which an attack is fairly easily cured, but there is a great liability to recurrence, especially if there also be definite seborrhœa of the scalp, which is not persistently treated. The treatment is both by internal and external remedies. Internally, arsenic, iodide of potash, salicylate of soda, and thyroid gland substance all have their supporters as good remedies, while externally tar, chrysarobin, and salicylic acid are the three substances which are the most generally useful; but the choice of remedy most suitable for any particular case depends on various circumstances, such as the acuteness or chronicity of the attack, and upon how much time the individual can give up to the treatment, so that further details would be useless, and ought to be left to a medical man to decide.

Ichthyosis, or Fish-skin Disease.—This is a disease which, in its milder forms, is fairly common, which tends to run in families, and which generally appears within the first year or two of life. In its mildest form it consists simply of dryness of the skin, especially in cold weather, and a slight tendency to scaliness about the knees, elbows, and folds of the armpit. In severer cases the scaliness becomes more and more prominent, and the area affected greater, until large parts of the body may look as if they were covered with scales like those of a fish, or even horny masses like those on a reptile's skin. Treatment consists in supplying the skin with the fatty substances in which it is deficient by means of frequent applications of lanoline or vaseline, and this alone will, in most cases, render the patient quite comfortable, although it does not cure the disease. No drug can be said to do this with any certainty, but the use of thyroid gland substance under careful medical supervision (for it is a risky substance to take in any haphazard way) often produces wonderfully good results, even if not a complete cure.

Pityriasis.—(*a*) *P. rosea* is not a very common disease. In it there appear on the trunk, about the waist usually, without any warning, rounded, slightly-elevated patches with a rosy-red border and fawn-coloured centre. The cause is quite unknown, but it is easily cured by soaking daily for half an hour in a bath containing several large spoonfuls of Condy's fluid, and thereafter rubbing all the affected parts with vaseline which contains 3 per cent. of salicylic acid.

(*b*) *P. rubra*, or *red scaliness*, is fortunately a rare disease, which may either arise spontaneously or develop out of other skin troubles, such as psoriasis, eczema, lichen planus, &c. In it the patient is almost as red as a boiled lobster, and huge quantities of scales are constantly coming off, being especially noticeable in the bed in the morning. The condition is often a serious one, even to life, and expert advice should be obtained.

(*c*) *P. versicolor.*—In this condition there is not so much scaling as the name pityriasis (Gr. *bran*) would suggest, although scales can usually be scraped off quite easily. It consists in the development of yellowish patches of varying size and shape, chiefly on the trunk. It is due to a fungus growing on the superficial layers of the skin, and is met with principally amongst those who perspire freely and do not change their underclothing very frequently. It is, or used to be, seen commonly on those who wore flannel chest-protectors, and in consumptives who heaped on layer after layer of clothing; but, as it causes no discomfort beyond some slight itching, it is often passed unheeded by patients. It can be got rid of easily enough by a hot bath each night, with good hard scrubbing with a nail-brush, followed by rubbing in of sulphur ointment. Two or three weeks of this should effectually kill off all the fungus, and, provided that the underclothing is all boiled and the uncleanly habits are dropped, there should be no return.

Ringworm, when not on a hairy portion of the body, also causes some scaliness. (See below.)

4. Skin Diseases affecting the Hair.—*Ringworm* is a disease due to the growth of a fungus on the skin, and in the hair follicles. Ringworm of the scalp is practically only found in children, and, even if untreated, will generally die out about the age of fifteen. The first symptom of the disease is the discovery of small spots from which the hairs have partly disappeared; those left are short, broken, and twisted in all directions. The presence of the disease is generally confirmed by removing one of these diseased hairs and examining it under a microscope, when the sheath of fungus growth around the hair can be readily seen. Ringworm, however, is not confined to the scalp; it may affect any of the non-hairy portions of the body, in which case it causes patches reddish in colour, slightly scaly, and spreading in rings—from which fact the disease obtains its name. On very moist parts, such as the groin or the armpits, there is still more marked redness and weeping skin. This form is specially common in warm countries, where it goes under such names as *craw-craw* or *dhobi itch.* (See Dhobi Itch.) On the chin in men it is with great difficulty distinguishable from *sycosis*—*i.e.* acne of the beard region (see above)—and the definite diagnosis can often only be made by a microscopic examination. Ringworm sometimes affects the nails, causing them to become dull, opaque, and brittle. (See under Nails, Diseases of the.)

Treatment.—On the non-hairy parts ringworm is usually cured easily by the application, night and morning for several days, of white precipitate ointment, or by painting the part daily for a few days with tincture of iodine, taking care to paint the skin for some little distance round the visible disease. Ringworm of the scalp is a much more difficult disease to get rid of, and it is practically never possible under six or eight months' careful treatment. Seeing that the disease, as mentioned above, tends to die out of its own accord, one might ask, "Why treat it at all?" The answer is that, if present in young children, it may lead to extensive patches of complete and permanent baldness, without mentioning the risk of infecting everyone with whom the child comes in contact. Various plans of treatment are adopted. Some of them consist in rubbing in drugs to destroy the fungus; other methods aim at stimulating the skin to throw off the growth by the application of powerful irritants; the diseased hairs may be pulled out mechanically by pincers, a method which is only suitable to small areas; or, lastly, the affected portion of the scalp may be exposed to X-rays, and under expert hands this method is found to be by far the most satisfactory, and with care should be perfectly harmless. We intentionally do not give the details of the treatment of ringworm, because the best method will vary with the extent and nature of the particular case, and practically all cases must be treated under a doctor's supervision if cure is to be attained. The same remarks apply to ringworm of the beard and of the nails. Ringworm is now generally recognised to be an infectious disease which it is difficult to cure, and until it is absolutely cured—which can only be ascertained by careful examination of the scalp and hairs—every precaution must be taken to prevent the spread of the disease to any other children with whom the patient comes in contact.

Favus, or Honeycomb Ringworm.—This is another disease due to the growth of a fungus on the skin. Its most striking feature is the development of more or less circular, cup-shaped, bright-yellow crusts on the skin, most commonly on the scalp. The hairs do not break off as in ordinary ringworm, but they become dull and faded in their appearance. This disease is one which undoubtedly can be, and is, spread by domestic pets, particularly cats. If the disease is at all extensive, there is a disagreeable mousy odour coming from the crusts.

Treatment.—This disease, unlike ordinary ringworm, does not tend to die out of its own accord, and the really only satisfactory method of eradicating it is by means of X-rays.

Alopecia Areata.—This means the development of small rounded areas on the scalp, completely denuded of hair. These tend to increase in size, and run together until almost all the hair of the head may disappear. The patches are smooth and somewhat sunken, and at the margin there are usually to be seen broken hairs with the shape of an exclamation mark. The cause of this disease is not definitely known. It does not appear to be a sequel of ringworm, but a perfectly separate disease, probably due to some germ, and, in all likelihood, slightly, if not markedly, contagious. If occurring in young persons, recovery will probably take place—slowly, no doubt, but usually completely. In an elderly person the chances of recovery are not quite so good, although even then the majority do get better.

Treatment.—Practically all forms of treatment consist in the application of some form of irritant to stimulate the scalp. One remedy may be found satisfactory in one case and quite useless in another. If a patient does not wish to have or cannot get a doctor's advice for this trouble, we would recommend that he might try ordinary sulphur ointment, to be rubbed in every night, or the application of weak ammonia to the scalp, gradually increasing the strength of the ammonia as tolerance is acquired. Other remedies sometimes employed are turpentine, vinegar, paraffin oil, &c.; and it is well, where the disease is apparently not being cured, to change the application and try something else.

For *ordinary baldness*, coming on, as a rule, from seborrhœa of the scalp, see under Baldness.

For *whitening of the hair*, which generally occurs as a slow process, coming on as age advances, but which may take place prematurely when associated with ill-health or other causes, we have no remedy to suggest. It may, of course, be darkened artificially by the use of various hair-dyes. This may be regarded as treatment, although it can scarcely be called a cure.

Hypertrichosis, or the Growth of Hair in Abnormal Situations.—Sometimes this is over a pigmented mole; at other times it is more widely and generally distributed, and no apparent reason for it can be discovered, although it is said to be commoner in those with greasy skins, or who are constantly using greasy applications. Where the hairs are few in number they are best removed by electrolysis; where numerous and widely spread, X-rays are the best method for permanently getting rid of them, but such treatment can only be applied by those who are thoroughly expert at it. There are no ointments or other forms of skin applications which will permanently remove hairs. The hairs may be dissolved by the application of sulphide of barium mixed into a paste with equal parts of oxide of zinc and starch, and spread on the part for about a quarter of an hour; but it must be understood that this merely removes the hairs temporarily, and the after-growth tends to be rather stronger than before.

5. Diseases of the Skin characterised by unusual Pigmentation or Discoloration.—*Addison's disease*, caused by a disease of the suprarenal glands beside the kidneys, is accompanied by a general bronzing of the skin, with gradually increasing weakness. (See Addison's Disease.)

The scars left by *syphilitic sores* are of a typical greyish-brown colour, while *lichen planus* (see above) leaves a typical deep-brown stain on the skin. Persons who have been taking *arsenic* or *silver salts* for long periods may show a dark pigmentation of the skin, which usually disappears in time when the drugs are dropped.

Freckles are small accumulations of pigment, most commonly seen in persons with fair skin, and usually confined to parts exposed to the sun. They can be removed by various remedies which cause peeling of the superficial layers of the skin. The most efficacious is probably corrosive sublimate. A $\frac{1}{2}$ per cent. solution of this in methylated spirit may be painted on, and allowed to dry on the freckled area, at night. Stronger solutions act more quickly, but at the expense of considerable blistering of the skin.

Chloasma is the name applied to spots or patches, varying in colour from light brown to almost black, which may appear on the forehead or face. They are most commonly associated with pregnancy, but may also occur from disease of the liver or other abdominal organs. The patches may be removed in the same way as recommended for freckles, but they will return if the disease from which the patient is suffering is not cured.

Leucoderma means complete disappearance of pigment from the skin in patches, which become of a death-like white colour. These patches may spread until a large part of the body may become of this blanched appearance. This disease is much more common amongst dark-skinned races, and is naturally more prominent amongst them, as the contrast is greater than on the comparatively white skin of Europeans. There are no symptoms, although sometimes persons so affected fear that they have leprosy, from their biblical knowledge of that disease. The conditions are not in the least associated, and distinction can at once be made between this disease and the patches of leprosy (which are only occasionally of a white colour) by the fact that in leprosy the patches lose their sensitiveness to touch and pain, whereas in leucoderma these sensations are unaffected. Treatment is sometimes requested for cosmetic reasons, but, unfortunately, it is not very satisfactory, although it has been found that the taking of tablets of suprarenal gland substance does bring about some degree of coloration of the white patches.

Albinism is the term applied to an entire absence of pigment from the hair, skin, eyes, &c., the subjects of this condition being known as *albinos.* The disease may be complete or partial. The condition shows a marked tendency to run in families, and it is practically always present from birth if present at all. Albinos may be otherwise perfectly healthy, but many are both physically and mentally feeble. There is no cure for the condition, but it is often necessary for an albino to use dark glasses to protect the eyes, because the absence of pigment in them allows the retina to be unduly exposed to the light, and inflammation of the eyes readily occurs.

The several diseases grouped under the heading *pityriasis* are characterised by pigmentation of a yellow, red, or brown colour, but in them there is also more or less scaliness of the skin, and they are described above under the group of skin diseases with a scaly eruption.

6. Growths of the Skin.—The familiar growths known as *corns* and *bunions* are described separately under corns. *Warts* are small, hard little tumours of the skin, which may be single or multiple in number. They are easily got rid of by snipping off with scissors, which may be done painlessly if the skin is first of all frozen with an ether spray. A slower but also satisfactory method, which may be applied by the patient himself, is to paint the warts daily with a salicylic collodion, such as is recommended for the removal of corns. Where warts are very numerous—*i.e.* by the hundred, as occasionally occurs—they may also be removed by exposure to X-rays.

Keloid is the name applied to a kind of large flat wart, with claw-like projections and of a bright, shiny pink colour. This form of growth only occurs at the site of a scar. Excision of the keloid is worse than useless, because it is certain to return in an aggravated form. It may be treated by X-rays, or by the injection of a substance known as fibrolysin.

Moles of various kinds are growths in the skin present from birth, although not always appearing until some time after birth. Their varieties and treatment are referred to under Moles.

Molluscum Contagiosum.—This is a disease which is often not recognised, being mistaken for ordinary warts. A small pimple appears, which swells and becomes red and irritable, and within a few weeks a group of similar little growths appears in the neighbourhood of the original pimple. They vary in size from a pin's head to that of a hazel-nut. They are probably due to some form of parasite, and the infection is most commonly picked up in public swimming-baths, although the connection between the two is not always recognised, because six weeks or more may elapse between the time of infection and the appearance of the first growth. If untreated, they may last and spread indefinitely. Where few in number, they may be snipped out with scissors, a somewhat painful but very certain method of cure. Another plan commonly adopted is to sharpen the end of a wooden match slightly, dip it in pure carbolic acid, and push this boldly through the thin stretched skin over the centre of the little growth, care being exercised not to allow the strong acid to run over the unaffected skin. Each separate growth must be treated in this way, the match being twisted round and kept in for a few seconds. Should the growths burst of their own accord, they ought to be carefully washed with some antiseptic lotion, such as 1 in 40 carbolic, and a dressing of lint applied, to prevent spread of the infection to surrounding parts of the skin.

Cancer of the Skin.—This may be secondary to cancer of other organs, particularly of the breast, in which case it appears as hard nodules, somewhat suggestive of the appearance of crocodile leather. But the skin affection is of comparatively little importance compared with that of the primary growth.

The form of cancer known as *epithelioma* commences as a small ulcer, usually about such parts as the lip, nostril, or the anus, or occasionally on other parts of the skin where there has been definite local irritation. Examples of this which may be mentioned are the epitheliomas starting on the hands of workers amongst paraffin, at the site of X-ray burns, or in ordinary scars. These growths usually occur in persons of middle age or over. They look very innocent at first, but rapidly increase in size, do not heal under antiseptic treatment like ordinary ulcers, and, if not speedily and completely removed, spread widely and lead to the death of the patient.

A special form of cancer starting in the skin is that known as *rodent ulcer.* It is most commonly met with on the face, especially about the corners of the mouth, nose, or eye. (For further description see under Rodent Ulcer.)

For affections of the skin due to animal parasites, of which the chief are lice and itch mites, see under Parasites and Itch.

Tuberculosis of the Skin, of which the commonest variety is *lupus vulgaris,* characterised by the development of nodules in the skin like pieces of apple jelly, is described separately under the heading of Lupus.

Leprosy is also described separately.

The only remaining common affection of the skin is *syphilis,* in which disease various forms of skin eruption may occur, and it is undoubtedly often a difficult problem for the doctor to decide whether any particular eruption is syphilitic in origin or not, the variety of syphilitic eruptions being so great, and their resemblance to the eruptions of other skin diseases being so close. Syphilis should never be diagnosed from a skin eruption alone. In the secondary stage, in which the skin eruptions are usually most prominent, there will practically always be enlargement and hardening of some of the groups of lymphatic glands or the mucous patches, and ulcerations about the soft palate or tonsils. The disease is not one of the skin alone, but is diffused throughout the whole system. (For further description see *Syphilis,* under Venereal Diseases.)

Skull, Affections of the.—*Fractures* of the skull, or wounds of the skull from gunshot injuries, require surgical treatment on account of the liability to compression of the brain. (For first-aid treatment of fractures see section of the book dealing with First Aid.) *Abscesses* may occur in the bones of the skull just as in other bones, one of the commonest situations being in the prominence behind the ear in connection with ear diseases. (See *Mastoid Disease*, under EAR, AFFECTIONS OF THE.) These also require surgical treatment. When there is *water on the brain*, the skull may become enormously enlarged, and sometimes the fluid has to be removed by tapping. (See under HYDROCEPHALUS.) *Defective formation of bone* in the skull bones is specially liable to occur in rickety children, and in this case the brain may be seen pulsating through the defective portions long after the period at which they should have been closed by bone—*i.e.* about the age of eighteen months. (For treatment see under RICKETS.)

Sleep, Disorders of.—Some of the peculiarities of sleep in children may be referred to firstly. A child's eyes are often not completely closed in sleep when it is suffering from pain, as in a severe illness. *Snoring* at night, with the mouth widely open, is very highly suggestive of the presence of adenoids and enlarged tonsils. (See ADENOIDS.) In *rickets* the sleep is often much disturbed, the child being constantly restless and throwing off the bedclothes. *Nightmare* is another disturbance of sleep of common occurrence amongst children. (For its causation and treatment see NIGHTMARE.) *Dreaming*, both in children and adults, must be regarded from a medical point of view as a form of partial insomnia, and, if at all persistent, shows that the individual's brain is not getting proper rest, the brain acting in disordered fashion whilst asleep, and the condition should be treated on the same lines as definite insomnia or sleeplessness. *Somnambulism*, or *sleep-walking*, is also a form of incomplete sleep, in which the muscles and the part of the brain controlling them remain awake, although the intellectual faculties are asleep. Sleep-walking varies in its degree from mere talking, slight movement, or rising from the bed to the performance of the most complicated actions. As a rule, on awaking the individual is quite unaware of what has been done in the sleep-walking state. The condition is closely allied to hysteria, or, at all events, is met with chiefly in persons with hysterical tendencies or of hysterical family. The treatment which is most satisfactory is one which is directed towards the general hysterical tendency, and for further details the article on HYSTERIA should be consulted. For the actual occurrence of sleep-walking it is best not to waken the individual, but to lead him quietly back to bed. It is sometimes found that the simple plan of putting a piece of cold metal or waxcloth at the side of the bed will prevent the individual from carrying the act further when he brings his feet in contact with this cold surface. The state of hypnotism is regarded as an artificially produced somnambulism, and certainly in many respects the two closely agree.

Insomnia, or Sleeplessness.—In children sleeplessness may be due to any feverish ailment, to a large meal shortly before going to bed, to overheated and ill-ventilated bedrooms, or it may simply be a bad habit brought about by the practice of picking up a young child whenever it cries. The treatment of sleeplessness in children is in most cases simply that of the disease causing it, or, if none can be found, a few doses of bromide of potash, say 5 grains in a wine-glassful of water every night for a child of five years or under, and double that amount for a child over five. In adults the causes of insomnia are naturally more varied. Sometimes it is an indication of, or accompaniment of, unsoundness of mind, but these cases form a comparatively small proportion of the persons suffering from insomnia. It may be due to pain (if severe enough), to fever, coughing, or shortness of breath—especially the shortness of breath due to heart disease, in which case the persons frequently fall asleep, but tend to wake with a sudden start almost at once. Simple coldness is also quite sufficient to cause sleeplessness. In all of these cases the cause of the sleeplessness is fairly obvious, and the treatment should, in the first place, be directed towards the causative disease; but remedies which directly cause sleep may be necessary, in which case the same hypnotic drugs may be used as for the forms of insomnia which fall into the following group, but it must be remembered in this connection that opium, morphia, or any of its preparations are seldom permissible remedies in persons with severe bronchitis or any disease of the kidneys. The other group of cases of insomnia includes those suffering from any severe mental shock or long-continued mental strain, such as business worries or overstudy. It also includes those in whom the blood-vessels of the brain remain congested with blood instead of becoming anæmic—a necessary preliminary to sleep. This constant congestion of the blood-vessels of the brain may be due to poisonous substances circulating in the blood, such as alcohol, products of tobacco, too strong tea or ccffee taken near bedtime, or the poisons not removed from the body in individuals who are habitually constipated or have badly-acting kidneys. In older persons the diseased condition of the blood-vessels of the brain itself is responsible for the broken sleep from which so many old people suffer.

Treatment.—Whilst the giving of a sleeping draught or hypnotic drug may practically always be depended upon to cause sleep, it is the very last measure which should be resorted to, and should only be employed where absolutely necessary to secure rest, and under the advice of a medical man, because of the great risk of a drug habit being established, or of the lesser but still considerable risk that sleep without the use of drugs may become almost impossible. Where a mental cause is at the root of sleeplessness, the prompt use of some hypnotic drug for a few nights may restore to the brain the power of sleeping without any further aid from drugs, but in other cases the sleeplessness will only disappear where the individual is removed from the causes of his worry and subjected to a thorough rest cure, such as is described under the treatment of neurasthenia. It may be mentioned that in this form of sleeplessness the patients constantly complain of feeling sleepy, but still they cannot sleep. In milder cases change of occupation before going to bed frequently helps, as, for instance, the reading of a little light literature for the last half-hour before retiring to bed. A warm bath, or hot drinks of a very simple nature, such as hot water or hot milk, will also help. Alcohol is not to be recommended as a sleep-producer, except, perhaps, in feeble, anæmic persons, in whom a small glassful of hot toddy at night will often produce sleep when almost nothing else will; but the dose must be small, and it should be discontinued as soon as the habit of sleep is regained. Where a sleeping-draught or hypnotic drug is required there is a large choice. Where pain is the cause of the sleeplessness, opium or some of its derivatives, such as morphia, gives the most satisfactory result, but it should not be taken except under medical advice, or, at all events, on not more than a single occasion. In an otherwise strong, healthy adult, 15 to 30 drops of laudanum might be given; it should never be given to children, nor, as mentioned above, to persons with severe bronchitis or kidney diseases. Its use should never be continued for long nor its dosage much increased, owing to the terrible risk of the morphia habit being formed. The safest and most generally useful hypnotic for physically sound persons suffering from slighter forms of insomnia is bromide of potash, which calms the nervous system in a perfectly safe manner. It should be taken after getting into bed, from 30 to 50 grains being dissolved in half a tumblerful of water and drunk off at once. The more powerful hypnotics, such as chloral, sulphonal, paraldehyde, veronal, &c., we intentionally do not give details concerning, because of all drugs they are those which must be employed with the greatest care, and should only be given under definite medical instructions. Electrical applications are sometimes also of value in the treatment of insomnia, especially the insomnia of neurasthenia.

Sleeping Sickness (synonyms, *negro lethargy, trypanosomiasis,* and a host of native names) is a disease which is met with in various parts of Africa. It was first recognised on the West Coast, but from there it has within recent years extended greatly, until it is now common and widespread through the Congo basin and around the great lakes in Uganda, and the upper portions of the Nile. It has occasionally been imported into the West Indies, apparently from West Africa, but has never become endemic there. The disease is now known to be due to a parasite called a *trypanosome,* which finds it way into the blood through the bite of various species of tsetse flies. The symptoms commence within a few weeks of the bite by an infected insect; they are due to the minute parasites setting up inflammation in the capillaries of the brain. The first symptoms are simply feverish attacks with headache, and occasionally a red rash on the body. Within a few weeks or months the habits and disposition of the patient will be noticed to change; he becomes apathetic, dull, careless, and dirty in his person. Sleep may be excessive, but, properly speaking, the condition is simply rather one of lethargy, from which the patient can be aroused, but into which he soon lapses again when left alone. Difficulty in walking also soon appears. The glands in the neck and elsewhere are often enlarged, but quite painlessly. The weakness and lethargy gradually become more and more marked, generally tremors may be seen in the muscles, and after some months, or it may be years, the patient passes into a state of coma or complete unconsciousness, ending with death.

Treatment.—Prevention consists in, as far as possible, segregating affected persons in fly-proof houses, so as to prevent the tsetse flies—the carriers of the disease—from becoming infected with the parasite. Unaffected persons should be careful not to expose their legs and hands to be bitten, and, where tsetse flies are numerous, it may be necessary, although uncomfortable, to wear thick gloves and veils constantly. White clothing is to be recommended in preference to dark, because it has been long observed that the tsetse fly, like many other insects, does not care to settle on it. The outlook when the disease has started is not favourable, because so far no drug is known which will certainly kill off the parasites in the blood, although the use of *atoxyl* and other substances may be efficacious if treatment is commenced in the very earliest stages. This drug is always administered by means of a syringe, being injected under the skin or into the muscles.

Smallpox is a severe acute contagious disease with marked fever and typical eruption on the skin, which, after passing through various stages, dries up and leaves distinct pits or scars. It is one of the most contagious diseases, and is almost certainly due to some living virus or germ, but, despite all the research which has been made, the direct cause of the disease still remains undiscovered. It occurs in all climates, and affects persons of both sexes and any age. Where the disease is prevalent, it is almost as common in childhood as measles is in this country. The disease is infectious from the very outset of the attack, but is especially so after the eruption appears. The atmosphere round a person with smallpox becomes charged with contagion, and it may linger for long periods about clothing, furniture, &c.; it may even be spread by the bodies of those who have died of the disease. The mortality from smallpox is enormous where it makes its first appearance in a country hitherto exempt from it, and the dark-skinned races suffer more severely than the whites. One attack of smallpox usually gives immunity for the remainder of life, but not invariably, as second attacks have been known. Overcrowding and insanitary surroundings undoubtedly tend greatly to the spread of smallpox once it has broken out in any community, but even in such surroundings almost complete immunity can be conferred if the population has been vaccinated. We cannot here go into the merits of the vexed question of vaccination and anti-vaccination; we can merely state our firm conviction that vaccination does offer almost complete protection against smallpox, and that the risks attendant upon vaccination are practically nil. It must be understood, however, that the protection afforded by vaccination only lasts for a certain period, generally less than seven years, so that revaccination after that time is necessary if complete protection is desired. This explains why in any large population, even where vaccination is regularly carried out, but where revaccination is not common, there will always be a considerable number of individuals who are susceptible to smallpox; so that occasionally outbreaks occur, although it is sometimes impossible to find out the starting-point of the disease.

Symptoms.—The period of incubation, or quiescent period after infection is acquired, and during which there are no symptoms, lasts from ten to fourteen days. Then for two or three days there is fever, with headache, severe pains in the back, sometimes vomiting, and occasionally a red rash on the trunk, resembling that of measles or scarlet fever. Then the typical eruption appears as hard, shot-like pimples over more or less the whole body, and with this rash the temperature falls. About the third day the pimples become little vesicles or blisters about the size of a pea, generally with a little dimple in their centre. About the seventh or eighth day the fluid in these little vesicles changes into pus or matter, and with this change the temperature again rises considerably. Each pustule, as it is now called, is surrounded by a red inflamed zone. They are tense and painful, and the whole skin is swollen to such a degree that the features may be almost unrecognisable. About the twelfth day the pustules dry up, forming scabs, which a little later on drop off, leaving depressed scars or pocks. During the stage of drying up the temperature gradually comes down, and at this stage there is also excessive itchiness of the skin. The general symptoms vary with the severity of the case. In severe cases there may be diarrhœa, pneumonia, pleurisy, delirium, &c., and in these cases the pocks tend to run together, or there may be hæmorrhages in them (the so-called "black" smallpox), and there may be eruptions not only on the skin, but on the eyes, mouth, and throat. In persons who have been vaccinated, and who still have a certain amount of immunity remaining from their vaccination, the rash comes out more rapidly, the pocks are few in number, and the whole course of the disease is run through more quickly. These cases, however, are just as infectious to other persons as unmodified smallpox. The chief difficulty in the diagnosis is distinguishing smallpox—especially the modified variety—from chicken-pox. The main points of difference are as follows: the backache, headache, and delirium before the rash comes out are much more severe in smallpox than in chicken-pox; the shotty hardness of the pimples in the skin in their early stage is also distinctive, and, if they are present on the palms of the hands or soles of the feet, chicken-pox may be excluded; also, in smallpox, the eruption does not come out in a series of definite crops on two or three successive days, as is the case with chicken-pox.

Treatment.—Preventive measures consist, no doubt, partly in general attention to sanitation and cleanliness, but, as stated above, we do not believe that these measures in themselves guarantee any protection whatever against smallpox should it be present in the neighbourhood. Vaccination thoroughly carried out, and revaccination every seven years or so, is the only thing which can be regarded as giving complete protection. Should a person come into contact with or be in the neighbourhood of a person with smallpox, or handle material from smallpox cases, he can still acquire protection by immediate vaccination. The incubation period of vaccination is only eight days, and protection is given by this before the smallpox—which, as mentioned above, requires twelve days to incubate—can develop. All contacts with a smallpox patient should therefore be vaccinated at once, or, if this is refused, should be isolated and kept in quarantine for at least sixteen days, until it is known definitely whether or not they are taking the disease. For the actual attack isolation is necessary, and, wherever possible, this should be in a proper smallpox hospital, separated from any populous locality. In lieu of a proper hospital, a tent or wooden shed does excellently, given some means of warming it. The temperature of the sickroom or shed should be not less than 55° F.; free ventilation should also be provided. A soft bed or water-bed is also a great comfort to a patient with smallpox. The room should be darkened, and the use of red glass or orange-coloured paper over the windows is recommended, because it has been found that, where the patient is kept in a red light, the after-scarring or pock-marking is not nearly so severe. There should be no unnecessary furniture or hangings to harbour infection. The diet is that for any fever—namely, light, easily-digested liquid food, such as milk and soups, or custards and jellies, given in small quantities every two or three hours. Where the eruption is at all copious the hair should be cut short. In the early stages, where the backache is severe, opium has often to be given for the relief of the pain, in doses of, say, 10 to 15 drops of laudanum in a little water every four hours or so. The use of ice or aerated waters will also lessen the thirst and vomiting. When the vesicles are changing into pustules, alcohol has often to be added to the dietary to help to keep up the patient's strength. Each vesicle as it matures into a pustule—*i.e.* when the fluid in it becomes definitely opaque and yellow-looking—may be pricked, and the skin frequently washed with some antiseptic, such as Condy's fluid, a couple of tablespoonfuls to a pint of warm water, or the skin may be anointed with carbolic oil, which has the additional advantage of relieving itchiness, and also of anchoring and preventing the spread of the infectious discharge. The eyes must be watched carefully to prevent any infection of them, being frequently washed out with a boracic lotion or one of nitrate of silver, 1 grain in 1 ounce of water. The frequent application of carbolic oil until the scabs have all disappeared is to be recommended both for the comfort of the patient and for the prevention of spread of infection. In severe cases, where the patient is delirious, incessant watchfulness is necessary to see that he does not attempt to escape; and, as forcible restraint may be dangerous, the use of some hypnotic may be necessary. A patient cannot be considered free from infection until all scabs have disappeared and the little ulcers under them completely healed.

Smell, Affections of the Sense of.—The sense of smell may be temporarily lost from a cold in the head, or more permanently from other more serious diseases of the nose. Apart from nasal affections, it is occasionally involved from fractures of the base of the front part of the skull tearing across the olfactory nerves, or by the pressure on these nerves of tumours growing from the under surface of the front part of the brain.

Perversion of the sense of smell occasionally occurs in epilepsy, hysteria, &c.

No special treatment is, as a rule, available for affections of this sense.

Sneezing means the sudden expulsion of air from the nostrils with the object of removing some irritant substance from the upper air passages. It may be due to the presence in the nose of such irritants as snuff, or the pollen of certain plants and grasses, or it may even occur reflexly by coming suddenly into bright sunlight. It is also a symptom of various diseases, such as influenza, colds, and hay-fever, where there is catarrh of the nose, and in such cases it is accompanied by more or less profuse running at the nose. If any special treatment for the sneezing itself is required, probably the best remedy is menthol, which may be obtained either in the form of snuff, or the menthol preparation known as coryfin may be introduced into the nose on a little pledget of cotton-wool.

Snoring is the noisy breathing due to flapping of the soft palate when air is entering both by the mouth and the nostrils. It may be simply a bad habit, or it may be the result of certain diseases: for instance, where there is any obstruction to the discharge of air through the nostrils breathing must be carried on through the mouth, when snoring is almost certain to occur at night during sleep. It is one of the most striking symptoms of adenoids in children. It may also be due to a paralysis of the palate, such as occurs in various diseases of the brain, either of a temporary or permanent nature. Examples of these are drunkenness, apoplexy, post-diphtheric paralysis, poisoning by opium, &c. The more serious and permanent form of snoring, particularly when it is accompanied by unconsciousness, is generally known as *stertor*, or stertorous breathing, and in this case the sound may be due not so much to the flapping of the soft palate as to the falling back of the root of the tongue against the back of the throat. For this the proper treatment consists in pulling forward the tongue, or in turning the patient on to one side, so that the tongue does not tend so readily to fall back.

Snuffles is the name applied to the noisy snuffling breathing in children where the nostrils are blocked by discharges. When it appears in very young infants, it is commonly due to the presence of congenital syphilis. (See under VENEREAL DISEASES.)

Softening of the Brain.—See under BRAIN, DISEASES OF THE.

Somnambulism.—See under SLEEP, DISORDERS OF.

Sore is the term popularly applied to an ulcer. (See ULCERS.) Special forms of sores are *veldt sores*, which are common in South Africa. They consist of shallow ulcers covered by crusts, which are very slow to heal. The extremities are the parts chiefly affected. The treatment consists in washing the sores with some antiseptic lotion, such as 1 in 40 carbolic, and dusting them with some antiseptic powder, such as iodoform or europhen, keeping them covered up with some antiseptic lint or gauze until they heal. (For the description of ORIENTAL SORE see under that heading. *Soft* and *hard sores* are referred to under VENEREAL DISEASES. *Sore throat*, see under THROAT, AFFECTIONS OF THE.)

Spasms.—A spasm means a sudden involuntary contraction of muscles, either one of the ordinary body muscles or of the muscles in the walls of some one or other of the hollow organs of the body. If the spasm is a severe one, it may be exceedingly painful. General spasms affecting the muscles of the whole body are generally referred to as convulsions. (See CONVULSIONS.) When spasms affect one muscle or one group of muscles of the body, they are usually called cramps. (See CRAMP.) Another variety of spasms of muscles is that occurring in St. Vitus' dance or chorea, and spasms of an allied nature occur in certain trade disabilities, such as writer's cramp. (For a description of these see under CHOREA and CRAMP.) Spasm affecting the walls of the hollow organs is usually spoken of as colic when it occurs in any of the abdominal organs. (See COLIC.) Spasms also occur in such diseases as angina pectoris, asthma, epilepsy, hydrophobia, croup, various nervous diseases, lockjaw, whooping-cough, and wryneck. (See under these headings.)

Spastic paralysis means that form of paralysis where the limbs are stiff, and where spasms or twitchings may readily be set up by tapping the paralysed muscles or their tendons. (See under PARALYSIS.)

Speech, Affections of.—Alterations in the voice sounds, in the manner of speech, or in the ability to produce or understand words, may arise from affections of any part of the speech mechanism. The object of this article is simply to indicate the various affections which may occur, and to refer the reader to the particular disease which is likely to be responsible for it.

Loss of voice, whispering voice, or *hoarseness* is most commonly due to laryngitis, but may be caused also by the specific inflammation of the larynx which occurs in measles, diphtheria, and other fevers, and also by syphilitic or tubercular disease of the larynx. Tumours about the vocal cords may also be responsible, and so may simple over-use of the voice. (See THROAT, AFFECTIONS OF THE.) Interference with the nerve supply of the muscles of the larynx is another cause; this occurs in some nervous diseases, and also from pressure on the nerves by tumours or by an aneurism of the aorta.

A nasal tone is imparted to the voice when there is any obstruction to the free entry of air through the nose, as in the case of a common cold, and also in other diseases of the nose; also when there is any affection of the soft palate, such as ulceration, paralysis, or cleft palate.

Dumbness—inability or unwillingness to speak—is present in those who are congenitally deaf, or in children who become deaf before they have acquired the power of speech. It may also come on in later life from hysteria, melancholia, or dementia.

Stammering is a defect which requires no special description. Its causes and treatment are given under that heading.

Slurring speech, like that of an intoxicated person, is commonly a symptom of general paralysis of the insane.

An indistinct, *mumbling* method of speaking may simply be due to absence of teeth or some inflammation of the tongue, or it may be an indication of some form of paralysis commencing to affect the muscles of the tongue, mouth, or lips.

Scanning or *staccato* speech, in which the individual speaks slowly, syllable by syllable, is an important symptom of the nervous disease known as disseminated sclerosis.

In chorea or St. Vitus' dance the speech has often the same jerky character as the movements, and may even be so badly affected as to be a mere confused tangle of words.

Gasping, interrupted speech occurs in any one suffering from great shortness of breath, or in a condition of feebleness, when the voice may also be so weak as to be simply a whisper.

When the defect of speech is not one of articulation, but an inability to produce speech at all, or to understand it when spoken or when written, it is spoken of as *aphasia*. This is always due to some brain affection. (See APHASIA.)

Spinal Cord, Diseases of the.—The spinal cord is that portion of the nervous system situated within the spinal column, and continuous above with that part of the brain known as the medulla oblongata. It extends from the base of the skull to just below the level of the lowest rib, and from it a number of nerves come off, one pair corresponding to each vertebra of the spine. These go to supply various muscles and organs of the body with power of movement, and they also carry sensations from the skin, &c., to the spinal cord, and from it to the brain. It is composed of grey and white matter just like the brain, the grey matter containing the nerve cells, the white matter the fibres running to or from them, and which, outside of the cord, constitute the nerves. The spinal cord may be the seat of various diseases, both of an acute and chronic nature, and the membranes covering the spinal cord practically always share in the affections of the membranes of the brain. The chief of these is meningitis. (See under MENINGITIS.) Inflammation of the cord itself, or myelitis, may be of an acute or chronic character. The chief symptom of acute myelitis is paralysis not only of the power of movement, but also of sensation. A special form of myelitis, occurring chiefly in children is that known as infantile paralysis. (For further description and treatment of these conditions see under PARALYSIS.) Another slowly-developing form of paralysis due to disease in the spinal cord is that known as progressive muscular atrophy, in which the muscles gradually waste and become feeble. (See under PARALYSIS.) Other diseases due to affections of the spinal cord are locomotor ataxia (see under that heading) and disseminated sclerosis (see DISSEMINATED SCLEROSIS and under NERVOUS DISEASES).

Spine, Diseases and Injuries of the.—Children are sometimes born with a defective development of a part of the spine, usually, but not always, at the lower part of the back—the condition known as *spina bifida*. In this condition there is a bulging out of the membranes covering the cord, forming a swelling in the middle line of the back, usually below the waist, about the size of a hen's egg or even larger. The skin over the swelling is often somewhat thin and translucent, or occasionally it may be covered by a large growth of hair. On compressing the tumour it can generally be diminished in size (but this procedure may bring on convulsions), and there will be a distinct impulse in the swelling when the child coughs or cries. In some cases, particularly those covered by hair, there are no symptoms, and nothing requires to be done. In others there is great risk of the thin skin rupturing, in which case death is likely to occur, either from the sudden escape of fluid or from the onset of meningitis. Some cases can be improved or even completely cured by operation; in others the most that can be done is to keep the swelling protected from injury by a suitable cap or covering. It will be necessary to have the particular case examined by a surgeon to decide as to what is best to be done.

Lateral Curvature of the Spine.—Also known as *scoliosis*. This consists in bending of the spine to one side, accompanied by some degree of rotation of the vertebræ of the spine. It may be due (1) to rickets; (2) to any condition of asymmetry of the body, such as shortness of one leg from fracture, joint disease, or from the falling in of one side of the chest as a result of empyema. In such cases the lateral curvature must be looked upon as of a compensatory nature. (3) The commonest form of lateral curvature is that occurring in young growing people, especially girls who are anæmic, badly fed, living in unhygienic surroundings, or simply growing too fast. The immediate cause of the deformity is often very slight, such as constantly standing on one leg, carrying a heavy weight on one arm, or resting constantly on one elbow when sitting in a constrained position, such as at a low school-desk. In such cases the carriage becomes bad; one shoulder will be noticeably higher than the other. On one side of the chest the ribs are huddled together, and breathing cannot occur properly. The deformity in the chest may even become so bad as to look like a humpback, such as results from tubercular disease of the spine. Pain in the back may be complained of, but it is not usually a prominent symptom. The individual's general health, however, will remain poor, and growth is stunted so long as this deformity is allowed to continue. If treatment be taken in hand before the deformity of the spine has become set—which can easily be told on examination—a complete cure may be looked for. If, on the other hand, the deformity cannot be made to disappear on extension of the spine, then a complete cure cannot be expected, but considerable improvement will still probably be possible.

Treatment.—In the case of compensatory lateral curvature, high-heeled boots or some such other appliance ought to be used to make the two lower limbs equal in length, and thus prevent the necessity of the spine being bent to one side. In the commoner variety, occurring in young growing persons, the general health should be improved by a course of tonics, and, if possible, a visit to the seaside. But, above all, special massage and exercises under the direction of some one who has made such exercises a specialty are necessary. To prevent any recurrence, errors of position should be corrected, and suitable desks and chairs supplied. Supports to the spine, such as plaster of Paris jackets or metal springs, are only required in very bad cases, and even then should not be worn continuously, because they render the muscles of the back weak from disuse.

Round shoulders may occur from continuous stooping, and are often seen in young people who are very short-sighted. In older persons they may come on from the carrying of heavy weights, or also from constantly stooping over work. Round shoulders may also result from rheumatoid arthritis affecting the spine, and they are constantly seen in persons suffering from chronic bronchitis with emphysema, and in the subjects of paralysis agitans. Treatment is impossible in the majority of cases, but, where the condition is seen to be coming on in young people under much the same circumstances as lateral curvature, it may be prevented by similar treatment, especially by massage and suitable exercises. Undue fatigue must be prevented, and the child should lie flat on its back several times a day for half an hour at a time, and at night no pillow should be used, or, if there is one, it should be beneath the shoulders, and not beneath the head.

Angular Curvature of the Spine.—This is practically always due to *tubercular disease* of one or more of the vertebræ, and it is sometimes known by the name of Pott's disease from the surgeon who first described it, although similar results occasionally follow from a fall or a severe blow on the back, causing a partial fracture of the spine.

Symptoms.—Angular curvature of the spine—some part or other of the spine sticking out prominently in a sharp curve—is really the result of Nature's method of repair, and should, if possible, be prevented by early recognition and treatment. The earliest symptoms are pain, and rigidity or stiffness in the back. The pain is not always extreme, and may only be elicited on careful examination of the back by pressure, or on tapping the spine. There may also be pain quite away from the spine, either in the legs, the arms, or in the trunk, from pressure on the nerves going to these parts as they come out from the spinal canal. Stiffness of the back is a constant and most important symptom. It is due to a muscular spasm, the object being to fix the part and prevent movement, and thus diminish pain. The subject of Pott's disease will be noticed to abstain from all movements which would bend the spine, and, in cases where the neck portion of the spine is involved, the head is kept fixed, so that, when wishing to look sideways, the patient twists his whole body round. These two symptoms ought to make one look for this disease before definite deformity and angular curvature result. When it does develop, it is due to the bodies of one or more of the vertebræ sinking in on each other in the process of healing, with the result that typical hunchback develops. Another result of tubercular disease of the spine is *abscess formation.* When the bones of the neck portion of the spine are affected, chronic *retropharyngeal abscess* forms, which causes a swelling at the back of the mouth, and from its size leads to difficulty in swallowing and breathing. When the vertebræ of the chest portion of the spine are affected, the abscess is likely to form on the back, at one side or other of the spine. In disease of the lower portion of the spine there may be a large cold abscess form about the small of the back, or the matter may burrow down the sheath of the psoas muscle and appear as a swelling in the groin—a *psoas abscess.* The most serious result of tubercular disease of the spine is paralysis from compression of the spinal cord within the spinal canal. This may be due either to an extension of the tubercular disease into the meninges or coverings of the cord, or to the sharply-bent spine giving way and compressing the cord. Tuberculous disease of the spine is always a serious condition, and treatment must invariably be prolonged and tedious, but, if taken in hand early, there is every probability of its being successful. The main essential in the local treatment is complete rest of the spine, so as to allow the part to heal with the least possible deformity. In the earliest cases this may be accomplished by keeping the patient lying on the flat of his back for several months, or, perhaps even better, except in the case of very young children, the patient may lie on a suitable couch face downwards, since by this means the weight of the body is taken off the spine, and local applications can be more easily made to the back. Immobilisation may be aided by placing heavy cushions or sandbags alongside the patient's body. Not infrequently along with this there is combined extension by means of weights and pulleys attached to the legs, so as to keep the spine fully extended, the counter-extension being provided by the weight of the patient's body, the lower end of the bed being tilted up. In more advanced cases the usual method of treatment is by means of a plaster of Paris jacket, and, where the neck vertebræ are affected, a padded collar or jury-mast running up from the plaster of Paris jacket is employed to keep the head firmly fixed in one position. Where chronic abscesses form in connection with tubercular spinal disease, the outlook is rendered rather more serious owing to the difficulty of getting these to heal, and from the risk of mixed infections occurring within these abscesses. They are sometimes opened and drained; at other times the pus is drawn off with a syringe, and some antiseptic, such as an emulsion of iodoform, injected into the abscess. Even where complete recovery does occur a considerable degree of stiffness must naturally result, and this is, of course, permanent. In addition to these measures directed against the local disease in the spine, the general treatment applicable to all forms of tubercular disease is necessary—*i.e.* fresh air in abundance, plenty of good nourishing food, and tonics. (See under Tuberculosis.)

Tumours of the spine occasionally occur, giving rise to pain from pressure on nerves coming from the spinal cord, and possibly to paralysis. A visible tumour or swelling is not by any means always to be detected, and such cases are very seldom operable, the disease being, as a rule, too widely diffused.

Injuries to the Spine.—*Sprains of the back and spine* are fairly common, resulting from any sudden or unexpected movement, such as falls, twists, or railway accidents. There results pain and tenderness to pressure in the back, with perhaps a little swelling. The pain is always more serious on movement, so that the back is kept rigidly stiff. In severe cases there may even be hæmorrhage into the spinal canal, with resulting compression of the cord and some degree of paralysis, but in most cases this will pass off with rest and time. Treatment consists at first of complete rest, with the application of hot fomentations to the injured part. As soon as it can be borne, massage with some stimulating liniment, such as turpentine liniment, should be commenced, and in the majority of cases complete recovery may be expected.

Fracture of the spine may be due to direct violence, such as a blow, or fall of a heavy weight on the back, or a fall over some projection; or, on the other hand, it may be due to indirect violence, as, for instance, when a person takes a header into shallow water and fractures the spine in the middle of the back, or by a weight falling on the back of the neck, when the spine gives way at a weaker part lower down. The fracture of the spine is usually a combined fracture and dislocation—*i.e.* there is considerable displacement of the bodies of the vertebræ as well as fracture. The seriousness of the injury depends upon whether the spinal cord within the spine is compressed or not. If it is, the person will be completely paralysed below the site of the injury. If it occurs in the neck, the condition is usually rapidly fatal. When lower down, the patient may live a long time a more or less helpless invalid. (For first-aid treatment see section of the book dealing with First Aid.) The permanent treatment will naturally depend upon the degree of the injury. In some cases operation can be successfully undertaken, particularly in those cases where the bodies of the vertebræ are not broken, but where there is merely a portion of bone driven down on the spinal cord. This can sometimes be removed by operation, with complete recovery. In some cases, also, the fracture may be reduced by extension or pulling on the spine under an anæsthetic, with prolonged fixation afterwards in order to allow the bones to heal in proper position. Where these procedures cannot be carried out, and where the patient remains permanently paralysed, great care and watchfulness are necessary in nursing. Bedsores are extremely liable to form on all points of pressure, and it is necessary, therefore, to see that the sheets are placed smoothly without any creasing, and that no contamination of the bed-linen by the patient's excretions is allowed. The skin of the back must be washed daily, and rubbed with some hardening application, such as spirits of wine. If any portion of the skin begins to get red, it may be painted with collodion, and protected from pressure by placing under it a nest of cotton-wool or a small circular hollow water-bottle. The patient may be with advantage kept on a water-bed in the later stages of the disease, but not at first, until the fracture has been healed; or, in order to avoid turning over in bed, a divided mattress may be employed, so that half may be taken out at one time, thus allowing one side of the back to be attended to without disturbing the patient's position at all. A bed-pan can also be introduced in this way without disturbing the patient in the least. The bladder in these cases is usually paralysed, and the urine has to be drawn off by a catheter. One of the greatest risks which these patients run is the production of an inflammation of the bladder from this constant introduction of instruments. Even with the greatest possible care infection may be introduced when drawing off the urine. The nurse or attendant will require to be shown how to do this, and the most conscientious and scrupulous care must be observed in the performance of this duty. The control of the bowels is sometimes lost; more often there is a condition of extremely obstinate constipation, and it is often advisable simply to have the bowels moved once or twice a week by means of a large enema of soapy water.

Compression of the spinal cord may arise in other ways than by fracture or dislocation of the spine, as, for instance, by hæmorrhage into the spinal canal or in Pott's disease. The chief symptoms are the same as those resulting from fracture, and treatment is carried out on the same lines.

Spit.—See Expectoration.

Spleen, Affections of the.—The spleen is an organ which is concerned with the formation of the blood, particularly of the white corpuscles of the blood, although it does not appear to be absolutely essential to life, since persons can live apparently perfectly well after its removal. In certain diseases of the blood, enlargement of the spleen is one of the most prominent symptoms, particularly in the disease known as leucocythæmia. (See under Blood, Diseases of the.) In this disease the attention of the patient is frequently drawn to a swelling on the left side in the upper part of the abdomen, due to the enlarged spleen, and tenderness near this region is often complained of. In certain acute infectious diseases, of which typhoid fever may be mentioned as one of the most prominent, the spleen also becomes enlarged, although not to the same extent as in leucocythæmia. Still it may be sufficiently large to be felt as a firm resistent swelling below the ribs on the left side. No special treatment, however, is necessary for the enlargement of the spleen in these fevers. In chronic malaria, and in the tropical fever known as kala-azar, the spleen also becomes greatly enlarged and softened. One of the great dangers in these conditions is rupture of the spleen from, it may be, a very slight blow over it. The symptoms of rupture are those of excessive hæmorrhage, the patient immediately becoming pale and collapsed, and, if surgical treatment (opening the abdomen and arresting the hæmorrhage) is not at once available, death is exceedingly liable to ensue. Rupture of the spleen may also occur, even when there is no enlargement, from grosser forms of violence, such as being run over by a waggon, or firm compression against a wall in a lift accident, &c. Similar symptoms will be observed, and the same treatment is necessary. There is one somewhat rare form of anæmia, called *splenic anæmia*, characterised by enlargement both of the spleen and of the liver, with a tendency to the occurrence of hæmorrhages from the nose, stomach, bowels, and elsewhere, and to attacks every now and again of feverishness with loss of strength. In this particular form of anæmia the white corpuscles in the blood are markedly diminished in number, instead of being increased as in most other forms of anæmia. This disease occurs chiefly amongst adult men, and, although the cause is not exactly known, it is apparently due to the spleen, because removal of the enlarged spleen has in certain cases brought about a complete cure. There is no other treatment which is known to have any good effect in stopping the downward progress of persons with splenic anæmia, or Banti's disease, as it is sometimes called.

Splenic Fever.—See Anthrax.

Sporadic Cretinism.—See under CRETINISM.

Spotted Fever.—See under MENINGITIS, *Epidemic Cerebro-spinal.*

Sprains.—See section of the book dealing with First Aid.

Spring Catarrh is a form of conjunctivitis or inflammation of the eye of a chronic nature, continuing throughout the spring and summer months, but practically disappearing in the winter-time, and met with chiefly in children. It is sometimes associated with hay-fever. It usually affects both eyes, and tends to persist intermittently for several years, and then dies out without leaving any ill effects. There is no definite cure known, but the wateriness, itching, and sensitiveness to light in the eyes may be relieved by wearing smoked glasses, applying cold compression over the eyes, and using drops of a 1 in 10,000 solution of adrenalin. (See also *Conjunctivitis,* under EYE, DISEASES OF THE.)

Sprue.—A tropical disease known also under the names of *hill diarrhœa, Ceylon sore mouth, &c.* It is met with chiefly in Ceylon, Southern India, the Malay Archipelago, Australia, and some of the Pacific Islands. The disease usually commences with slight attacks of sore mouth, indigestion, and morning diarrhœa. At first these symptoms are slight and only occasionally present, but they gradually become worse and more and more constant. On examination of the mouth it will be seen to be raw, and it becomes so tender that taking of food is a very painful process. A patient will also complain of dyspeptic symptoms, especially flatulent distension of the abdomen after meals, with acid eructations and sometimes vomiting. The diarrhœa, which is always worst in the morning and sometimes absent for the rest of the day, may be very excessive, the stools being copious, pale, frothy, and very offensive. The patient's strength becomes gradually undermined, and he tends to become emaciated, depressed, and irritable mentally. The cause of the disease is at present quite unknown, and until it is discovered treatment is hardly likely to be satisfactory. Wherever possible—*i.e.* if the patient's strength will permit of it—a person suffering from sprue should be sent from the tropics to a temperate climate. Otherwise the treatment is largely dietetic, but as complete rest as possible is advisable. Various forms of dietetic treatment have been adopted. One consists of almost a pure milk diet, the milk being taken every two hours in small quantities, say a quarter of a pint to begin with, gradually increasing the amount as the motions become less frequent. Another form of diet, which is that most advocated, is the so-called "fruit cure," which may be used in conjunction with the milk diet where that is not well tolerated. In the fruit cure large quantities of fresh fruit, or fruit preserved without sugar, are taken, the best fruits being strawberries, grapes, bananas, pears, and apples. Another dietetic cure, which may be employed if the milk or fruit diet is not found satisfactory, is one consisting almost entirely of meat, and some authorities with a large experience of this disease advocate it from the commencement. In severe cases raw beef-juice may be given, or small quantities of pounded meat. Sometimes a modified meat diet is employed, milk artificially soured by means of sauerin or other artificial cultures of lactic acid bacilli being given three or four times a day between meat meals. Drugs appear to be of very little use in this disease, although it should be mentioned that, in Hong Kong particularly, the use of yellow santonin in doses from 3 to 5 grains, given in oil night and morning for a week or two at a time, has been said to be of considerable value. The santonin, however, must be the old yellow variety. The sore mouth may be treated by mouth washes, such as glycerine and borax, or with 1 per cent. carbolic acid in water.

Sputum, Abnormal Appearances of.—See EXPECTORATION.

Squint.—Squints which are developed in early childhood are usually due to some error of refraction, generally in the direction of long-sightedness, and can in most cases be remedied by suitable glasses. If they persist, it may be necessary to have some of the muscles acting on the eyeball either shortened or lengthened—a small operation, but one requiring extreme nicety of judgment and skill in performance. Squints are sometimes due to defective vision in one eye, which also may be remedied by suitable glasses. Squinting in other cases, particularly when it comes on more or less suddenly, will in all probability be due to some affection of the brain, or to the nerves which supply the eye muscles, in which case glasses are not likely to cure the condition—indeed, whether it is curable or not will depend entirely upon the nature of the disease bringing it about. This will necessitate careful examination by an oculist.

Stammering or stuttering is due to the imperfect control of the respiratory muscles in the act of speech, some of the muscles going into a spasm when the person attempts to speak. The causes which lead to this imperfect control are twofold. One may be said to be inborn or constitutional, stammering being commonest in persons with nervous tendencies or a neurotic inheritance. A family history of stammering is not infrequent, and it is also by no means unusual to see the spasm affect muscles other than those of respiration—for instance, twitching movements of the face or arms may be seen in stammerers. The other group of causes which lead to stammering may be summarised as anything which interferes with breathing in early life, such as adenoids, asthma, rickets, or repeated attacks of cold. Imitation is a factor responsible for some cases of stammering, but only in those of a nervous disposition. The treatment ought to be as far as possible preventive. One cannot, of course, do away with a nervous inheritance, but a child of this type should be very carefully brought up, on the same lines as are indicated under the treatment of nervous diseases. The general health of such a child must also be carefully attended to, because anything depressing it will tend to accentuate the tendency to stammering. Fresh air, regular habits—particularly as regards work—are also of great importance. Breathing exercises are of the very highest importance, stammerers frequently having to be taught how to breathe properly. It is impossible within the limits of such a work as this to go into these exercises in detail. They will be found fully described by Mrs. Behnke in her book on the

Speaking Voice, a work which can be thoroughly recommended to every one with a stammerer to treat. In the case of children, it is usually advisable to remove them from the company of other children for some time, until the education in speaking has been well started, and a teacher who can give individual instruction should, if possible, be obtained. The main part of the cure may be described as educative, the chief aim at the start being to get the sufferer to attend only to his breathing and respiratory movements, the difficulties of articulation being at first ignored, and it is found that the articulation very soon comes to look after itself. Reading aloud, with accentuation and prolongation of the rhythm, forms another important part of the treatment. Many stammerers, it will be observed, speak in a thin little voice, due to their improper method of breathing, so that it is well to encourage stammerers to speak in as full and resonant a voice as possible. Perseverance in the treatment is very necessary, progress at first being, as a rule, very rapid, but after a certain point it is much slower, and discouragement is very apt to occur. Sometimes this is because patients go stale in their treatment, in which case it is advisable to give up all attempts for a few days or so, beginning again later, when it will usually be found that more rapid progress can once again be made; but for long periods incessant watchfulness is necessary, for the malady may recur.

Status Lymphaticus.—See under LYMPHATISM.

Sterility and Impotence.—By impotence is understood inability to perform the sexual act; by sterility, inability to procreate, a condition which may or may not be associated with impotence. The causes of sterility in marriage may be on either side, but, although it is undoubtedly oftener in the female than in the male, it is a great mistake to assume straight away that the fault is with the female, as is so often done. In some cases of sterility there is, indeed, no fault on either side; both husband and wife may be capable of procreation, but there is an incompatibility between them which prevents them from procreating with one another. Stock-breeders are well aware of this condition amongst animals. For this incompatibility as a source of sterility there is neither explanation nor cure. We shall now consider the question in the two sexes separately, premising that in any union where the question arises it is wise for the husband to be examined first, as the causes are more obvious, and can more readily be either detected or excluded.

(*a*) *In the Male.*—Impotence may be due to imperfect formation of the parts of generation, or may come on in such conditions as diabetes, wasting diseases, locomotor ataxia, and other diseases of the nervous system. Such causes are usually irremediable. More commonly, however, it is caused by run-down or neurasthenic conditions leading to (not caused by, as is commonly supposed) imperfect erections and premature and excessive ejaculations of semen. Other occasional causes are fear, repugnance, or lack of confidence. The treatment of such troubles consists, in the first place, of complete cessation from sexual attempts. A course of hydropathic treatment, with baths, tonics, and outdoor exercise, will then probably prove to be the best mode of treatment. The patient should have a talk over sexual matters with some reliable physician in whom he has confidence, so as to get rid of any false ideas about such matters which he very probably has. Sexual affairs should, if possible, take their course quietly, without being taken much notice of by the individual.

When there is no impotency, it will be advisable to have a little of the semen examined microscopically to see whether there are spermatozoa present in it or not. If there are, then the fault is not on the male side. If there are no spermatozoa present, the organs should be examined to see whether any remediable cause of their absence can be found. Such causes may be imperfect descent of the testicles, affections of the testicles, especially atrophy, which may follow on injuries, fevers, gonorrhœa, syphilis, and tubercular disease. (For treatment see under SCROTUM AND TESTICLES, DISEASES OF THE.) Old age or the enlargement of the prostate gland, which so commonly occurs with advancing years, may also lead to infertility.

(*b*) *In the Female.*—The causes of sterility in the female are somewhat numerous. A few of these are unhealthy modes of life, curable by the patient herself—viz. too frequent intercourse, excessive indulgence in alcohol, and obesity. Most cases, however, are only capable of being cured, if at all, by some form of internal treatment, usually of a surgical nature. Some are necessarily incurable from defective development of the internal organs of generation. It is needless to tabulate the various local diseases which may be responsible for sterility; almost any of those mentioned under the heading of WOMEN, DISEASES PECULIAR TO, may cause sterility, and the reader may be referred to this for further description and treatment.

Stertor.—See under SNORING.

Stiff Neck.—A form of muscular rheumatism to be treated on the same lines as muscular rheumatism in other situations, the details of which will be found under RHEUMATISM.

Stitch in the side is due to localised muscular cramp. (See under CRAMP.)

Stomach, Diseases of the.—*Indigestion* or *dyspepsia* is the most common symptom due to disorders of the stomach; it is, indeed, one more or less common to all affections of the stomach, a fact which is referred to under the article on DYSPEPSIA, and in some cases dyspepsia or indigestion may be the only symptom of gastric disease. Simple dyspepsia, usually the result of a chronic gastric catarrh, is fully dealt with under the heading DYSPEPSIA. The remaining disorders of the stomach fall to be considered here.

Acute Dyspepsia, or Acute Gastric Catarrh.—This may be part of a more general disease, as, for instance, the acute catarrh with vomiting, &c., which accompanies many fevers. It may be due to a comparatively slight indiscretion in diet in persons with irritable stomachs, particularly those with rheumatic or gouty tendencies, but most attacks of acute gastric catarrh are frankly due to excess of some article of food which, in more moderate quantities, might be quite a suitable part of the diet; alcohol and lobsters might be mentioned as typical examples. Lastly, it may be due to poisonous or quite unsuitable articles of diet, such as unripe or decomposing fruit, bad meat, &c. The symptoms are familiar, being those commonly described as an acute bilious attack. There is discomfort in the pit of the stomach, which may amount even to severe pain, with sickness or nausea, and vomiting. The tongue is foul and the breath offensive. There is complete loss of appetite, great thirst, and more or less headache. In severe cases there may be a considerable degree of fever. The affection not uncommonly extends downwards into the bowels, especially in children, setting up diarrhœa with colicky pains, and sometimes there is a spread into the bile passages, with more or less catarrhal jaundice. Such attacks usually last but a day or two, although, if recurrent, they may lead to persistent chronic catarrh.

Treatment.—The first point is to get rid of any irritant which may still be present in the stomach or bowels; for this purpose an emetic or purgative may be employed. Simple tickling of the back of the throat or the swallowing of hot water is usually sufficient. A little later on, when the stomach has had some rest, a spoonful of Gregory's mixture or one of sulphate of soda, dissolved in half a tumblerful of water, may be given as a purgative. To relieve the nausea and pain a mustard-leaf may be applied over the stomach, and sucking of ice generally gives great comfort. With regard to the diet, a day's starvation will in most cases be the best plan, combined with some soothing mixture for the stomach, such as dilute hydrocyanic acid three drops, and sub-nitrate of bismuth 15 grains, suspended in water. The first food to be taken should be milk, and light milk diet should follow for a day or two, by which time, as a rule, the attack will have completely cleared away.

Ulcer of the Stomach, or Gastric Ulcer.—This condition, which is of frequent occurrence, is most common in persons under the age of thirty-five, particularly women, in whom the disease is about twice as common as in men. It is very commonly associated with anæmia or bloodlessness. The symptoms of gastric ulcer are sometimes so outstanding that its presence cannot be missed. In other cases there may be practically no symptoms before the sudden occurrence of profuse vomiting of blood from the ulcer eating into a large blood-vessel, or the onset of acute abdominal pain from rupture of the ulcer through the wall of the stomach. In the majority, however, there are certain more or less definite signs which will at least suggest the presence of the gastric ulcer. One of these is pain in the upper part of the abdomen. This is more or less constantly present, but is considerably aggravated when food is taken, the pain coming on almost immediately after eating. This pain may be felt just at the lower end of the breastbone, or perhaps even more commonly in the back, between the shoulder-blades. Pressure over the stomach usually makes the pain worse, but sometimes it is found, curiously enough, that pressure relieves the pain. Vomiting is another fairly common symptom. Not infrequently it is encouraged, or even induced, by the patient simply for the relief of the pain. The most conclusive symptom, when present, is the vomiting of blood due to the ulcer eroding blood-vessels in the wall of the stomach. If the hæmorrhage is extensive, the blood may come up of a bright-red colour, but in the case of smaller hæmorrhages it resembles a mass of coffee-grounds. Where the hæmorrhage is slight there may be no vomiting of blood, but some hours afterwards the blood may be passed in the stools, giving them a black, tarry appearance. The symptoms of an ulcer in the duodenum, or first part of the small intestine, are very similar to those of ulcer in the stomach, excepting that the acute pain comes on at a longer interval after partaking of food, and the seat of the pain is a little lower down, and rather to the right of the middle line of the body, and it should be mentioned that duodenal ulcer is commoner in young men than in young women. In both of these conditions the first symptom may be the occurrence of an enormous hæmorrhage, so extensive even as to prove fatal, or the rupture of the ulcer into the abdominal cavity, with acute pain, collapse, distension of the abdomen, and rapid development of peritonitis. Both gastric and duodenal ulcer are practically invariably associated with considerable increase in the acidity of the stomach contents, and, in cases where the diagnosis is doubtful, it is now a common practice for the patient to be given a test meal, the stomach contents to be drawn off with a tube, and analysed to see whether or not there is excess of acid. This will then settle any doubt there may be as to whether certain symptoms point to gastric ulcer or cancer of the stomach, which may be associated with very similar symptoms. In the case of cancer the acidity is greatly diminished, instead of being increased as in gastric ulcer.

Treatment.—This will vary with the severity of the case. In milder cases, where the symptoms point rather to mere excessive acidity than to actual ulceration, the administration of alkalies, such as bicarbonate of soda, say 15 to 20 grains, or as much as will lie on a sixpence, after each meal, along with careful diet, may be sufficient to effect a cure, or the compound bismuth lozenges referred to in the treatment of dyspepsia may be used. Dieting is one of the most important methods of treatment for gastric ulcer. The strictness with which it has to be carried out will depend again upon the severity of the symptoms. In the worst cases the stomach requires to be given complete rest, the patient being fed for several days entirely by the bowel with nutrient enemata, being simply given a few sips of cold water by the mouth, and nothing more. Then peptonised milk may be given by the mouth, followed later by ordinary milk, beef-tea, and arrowroot; and until this stage is reached the patient should be kept entirely in bed. In less severe cases it may be, and often is, sufficient to start at the stage of plain milk, a very good plan being for the patient to take absolutely nothing but milk for several weeks, four or five pints being taken in the course of the day, in quantities of half a pint at two-hourly intervals, and a teaspoonful of phosphate of soda should be dissolved in each large tumblerful of milk. After the milk stage a lightly-boiled fresh-milk pudding, and a little bread and butter, may be added to the dietary. Where severe hæmorrhage occurs, the patient must be kept lying perfectly flat and absolutely quiet. He may be given a little ice to suck, but nothing else by the mouth.

Medical advice should be sought immediately, as sometimes operation to arrest the hæmorrhage is necessary, and the same applies even more forcibly to cases where perforation occurs. Should treatment on these lines not remove the symptoms; and the ulcer tend to become chronic, producing a general lowered state of health and vitality, without, it may be, ever being excessively severe, surgical aid again may be sought. The operation commonly performed in such cases consists in making an artificial opening between the stomach and the bowel, which permits the alkaline bowel contents to mix with the unduly acid contents of the stomach and neutralise them. This allows healing to occur, often with the most gratifying and permanent results.

Cancer of the Stomach.—The stomach is one of the commonest sites of cancer. Persons so affected are usually after middle life, although it is not altogether unknown in persons under thirty. Both sexes are liable to suffer from this form of cancer, but men more so than women. As with cancer in other situations, the cause is unknown, but one important factor at least in its causation is simple gastric ulcer. According to some surgeons as many as 50 per cent. of all cases of cancer in the stomach originate in an old gastric ulcer. Of course this does not mean that 50 per cent. of cases of gastric ulcer go on to cancer—far from it. Any part of the stomach may be affected by the growth, but most commonly it starts either near the outlet or near the inlet of the organ, particularly at the former site. The symptoms of cancer are in its early stages, unfortunately, very indefinite, but suspicion should always be aroused when a person in middle life, who has previously been healthy as far as his gastric organs are concerned, or who may have had a gastric ulcer some considerable time previously, begins to suffer for no apparent cause from indigestion. Indigestion of a kind indistinguishable from ordinary chronic gastric catarrh is an almost invariable symptom of cancer. The patient becomes gradually more and more unable to take food, and has attacks of vomiting, the vomit occasionally containing black, coffee-ground-like material—*i.e.* blood—although this is not usually present in such large amounts as in simple gastric ulcer. Along with this indigestion and inability to take or retain food there is emaciation, with loss of weight and strength, and an aching, gnawing pain in the region of the stomach and shooting through to the back. In such cases as this, examination of the stomach contents after a test meal, or of some of the vomited material; for the diminution or absence of the acid which is normally present, will often yield information of the greatest value in diagnosis. In later stages there may be a quite obvious tumour or swelling in the region of the stomach—*i.e.* just below the ribs on the left side. But it should be the aim of the physician to diagnose cancer before it reaches this stage, since, in the majority of cases, when this swelling becomes apparent the cancer is too far advanced for any radical treatment. When the growth is situated right at the outlet of the stomach, there may be marked obstruction to the outflow of food from it, with consequent dilatation of the organ, and the most prominent symptoms in such a case will be those of dilated stomach. (See below.) The outlook in cancer of the stomach is bad. In most cases where the disease is quite definitely diagnosable the patient's expectation of life may be put down as under two years. The only favourable cases are those where it is recognised very early, probably only after an exploratory opening of the abdomen on suspicion of the disease. In such cases it may be possible to completely remove the cancer and for recovery to occur. Even where this is not possible, operation may still afford great relief and prolong the life of the patient for many months. The operation consists in making an artificial mouth opening directly into the stomach when the disease is situated near the inlet, or in making an artificial exit from the stomach into a loop of bowel when it is obstructing the outlet. Where operation is impossible or is declined, treatment can only be palliative, the diet being limited to very easily digested articles. Washing out of the stomach is sometimes employed where the stomach is dilated, and in the majority of cases morphia will require to be administered for the relief of pain.

Dilatation of the Stomach.—It is impossible to lay down any exact limits with regard to the size of this organ, because it varies considerably in different individuals, and also in the same individual from time to time. The stomach should only be spoken of as dilated when it is permanently and quite distinctly so. Three factors, either singly or combined, may be responsible for dilatation: (1) Long-continued intake of excessive quantities of food, either solid or liquid. (2) Obstruction at the outlet of the stomach. This may result from the healing with cicatrisation of simple gastric ulcer, or it may be due to cancer of the stomach situated at or near the outlet, or it may be due to simple thickening of the muscular fibres surrounding the outlet. This last form is met with both in adults and in quite young children. Obstruction of the outlet may also be due to a kinking or dragging on the outlet from displacement of neighbouring organs, particularly by a floating kidney. (3) Loss of tone in the wall of the stomach may be responsible for dilatation, and this in its turn may result from chronic gastric catarrh, from anæmia, from nervous exhaustion or neurasthenia, or from any form of chronic disease where there is general enfeeblement of the bodily strength.

Symptoms.—Dilatation of the stomach produces discomfort and a sense of weight in the upper part of the abdomen, and there are frequent eructations of foul-smelling gas produced by the fermentation of the contents of the dilated organ. Vomiting becomes a prominent feature. Enormous quantities—four or five pints, it may be—of the fermenting contents are brought up at intervals, usually representing one or two days' intake of food. The nutrition of the patient suffers greatly. He becomes thin, and his colour is of a sickly muddy yellow. Examination of the abdomen will frequently reveal an obvious bulge in the upper part, and marked splashing can be elicited by catching the stomach between the two hands, one in front, the other at the left side of the abdomen. The diagnosis of a case which is at all well marked is usually quite simple. The important matter as regards treatment is to find out what is the cause of the dilatation. The most generally useful treatment is washing out of the stomach regularly every day, and for this purpose it is usually advisable to employ some antiseptic solution to destroy the organisms which set up the fermentation changes. The process of washing out is rather a disagreeable one, but patients very soon become accustomed to it, and in most cases can be taught to do it quite well themselves. A long, soft, rubber tube is pushed down into the stomach, and, by means of a funnel, the selected lotion for washing it out is introduced and allowed to stay for a few minutes; then, by depressing the funnel end, the stomach empties itself. The first washing is usually performed with a pint or two of warm water containing a tablespoonful or thereby of bicarbonate of soda dissolved in it. This clears off the sticky mucus from the walls of the stomach, and allows the subsequent lotion to come into better contact with it. Two antiseptic lotions which may be employed are permanganate of potash, 10 grains to the pint, or hyposulphite of soda, 90 grains to the pint, one or two pints being employed at a time, and two or three washings being carried out. This should be done regularly every morning for some considerable time. In milder cases, particularly those associated with general exhaustion, rest, combined with cold shower-baths, the use of tonics containing such drugs as iron and strychnine, and possibly the application of high-frequency currents over the abdomen, may effect a cure without actual washing out. But such measures are, in most cases, best combined with washing out, at least in the early stages of the cure. Where distension is very great, operation may be advisable, the operation consisting in making an aperture at the lowest part of the stomach, and connecting that with a coil of the bowel. In this way the stomach is enabled to empty itself easily. Where there is a definite obstruction at the outlet, either in the case of adults or infants, operation, of course, is the only method which can be expected to cure the condition. Diet is also of some importance, the main indications being to give easily-digested articles, and yet at the same time to avoid making the meals bulky; and, where fermentation with foul eructations is very marked, antiseptics may be taken by the mouth, such as creosote in 2-drop capsules thrice daily.

Cramps and Spasms of the Stomach, usually associated with considerable pain, may occur apparently without there being any gross disease in the stomach at all. The cause of these attacks is not always very obvious. They may occur in weakly, exhausted individuals, or in persons of markedly nervous temperament. Similar attacks, associated with excessive vomiting, sometimes occur in individuals with locomotor ataxia. Except where some definite reason can be found for attacks of this nature, the only treatment which can be adopted is some measure for the relief of pain, such as the application of a mustard-leaf over the stomach, hot fomentations or poultices, or, in the last resort, some pain-killing drug, such as phenacetin (10 grains) or morphia, although the latter should only be resorted to in very severe cases.

Stomatitis means inflammation of the mouth. (See under MOUTH, DISEASES OF THE.)

Stone.—See under BLADDER, DISEASES OF THE; also under GALL-STONES and KIDNEY DISEASES.

Stools, Abnormal Characters of the.—Important information as to the seat of disease and its nature may be afforded by an ordinary examination of the naked-eye characters of the stools, and sometimes it is also necessary to have them examined microscopically, especially when the presence of intestinal parasites is suspected.

The *colour* of the stools varies to some extent with the diet, milk and starchy foods tending to make them of a light-yellow colour, meat and red fruits tending to make them darker. Pale, clay-coloured stools indicate a deficiency of bile entering the intestine, especially in jaundice, when the odour is also unusually offensive, although not putrid. Excess of fat in the diet, or when there is imperfect fat digestion, as in some diseases of the pancreas, renders the stools of an almost milky whiteness. Green stools, most commonly seen in children with diarrhœa, indicate a hurried passage of the intestinal contents, so that the bile retains its original colour. Black stools may be due to the individual taking iron, manganese, or bismuth, but dark, tarry-looking stools (melæna) indicate the presence of altered blood, and point to the occurrence of hæmorrhage high up in the bowel or in the stomach, usually from a gastric or duodenal ulcer. Bright-red blood indicates that the seat of the hæmorrhage is much lower down, usually about the rectum or anus, such as from piles or some other affection of that region.

Odour.—In a nursing infant the stools should have simply a sour smell, not the fæcal odour of a normal healthy adult. The stools may become sour in adults when fermentation is going on in the intestine. The absence of bile in the stools, as mentioned above, renders them unduly offensive, and so does the eating of many eggs or the taking of sulphur or sulphur-containing waters, from the formation of excessive quantities of sulphuretted hydrogen. The copious watery stools of cholera are almost free from odour.

Shape and Consistence.—The stools are sometimes flattened or ribbon-shaped when there is a cancerous growth or other form of obstruction low down in the bowel. When there is habitual constipation, the stools usually have the form of hard, rounded masses or balls, often coated with mucus; always with constipation they are drier than normal. In all conditions with diarrhœa as a symptom, on the other hand, the stools are more liquid and unformed.

Slimy stools, from the presence of abnormally large quantities of mucus, indicate some affection of the large or lower bowel, generally of an inflammatory or catarrhal nature. In the particular affection of the large intestine known as *mucous colitis*, the mucus is passed in the shape of membranous casts of the bowel. When floating in water these look like pieces of grey, slimy tubes, some inches in length. In severe dysentery, ulceration of the bowel, or where an abscess has found its way into the bowel, the stools may contain a quantity of yellowish pus or matter.

Parasites may be seen in the stools; some of these may be visible to the naked eye, especially worms. The commonest worms are thread-worms, occurring chiefly in children, and looking like small pieces of cotton-thread about a quarter of an inch in length; tape-worms, long, flattened, and segmented; and round worms, looking like large earth-worms. Numerous other intestinal parasites occur, but mostly of such a small size that they can only be detected on microscopic examination. (See under PARASITES.)

Undigested pieces of food—*i.e.* not indigestible articles, but articles which normally should be digested more or less completely—are not infrequently found in the stools, and often form important evidence of improper feeding or of some upset of the gastric organs—*e.g.* the presence of firm milk-clots in the stools of children.

Strabismus is another name for squint. (See SQUINT.)

Strangulation is the term applied to the stoppage of the circulation in a loop of bowel where the latter passes through a narrow opening, such as is present in the case of hernia or rupture. The symptoms are those of obstruction of the bowels, and surgical treatment in such cases is always urgently necessary. (See under INTESTINES, DISEASES OF THE.)

Stroke is a popular term generally applied in the case of apoplexy. (See APOPLEXY.)

Stupor.—See COMA.

Stuttering.—See STAMMERING.

Stye.—See under EYE, DISEASES OF THE.

Sunstroke and Heat Exhaustion.—Exposure to excessive heat, not necessarily to the direct rays of the sun, but especially if it be a moist heat, may bring on symptoms of various kinds, either in the form of sudden collapse or of gradual exhaustion. Such effects are naturally most observed in tropical climates, but they may also be experienced in more temperate countries during warm weather, or in such overheated atmospheres as ships' stokeholds, &c. It may be confidently affirmed that perfectly healthy individuals are extremely unlikely to suffer either from actual sunstroke or from heat-exhaustion unless the exposure has been exceedingly severe and prolonged. Predisposing conditions are of great importance in the consideration of this subject. General debility and physical exhaustion, such as may result from long marching or hard muscular exertion in thick, heavy clothing, and, perhaps above all, alcoholic habits, are *the* conditions which render persons liable to suffer from sunstroke or heat-exhaustion. It will readily be seen that men will suffer more than women. There are two main types of cases—one with fever and great rise of temperature, and one without fever. In the latter the onset of the symptoms is gradual, the individual simply becoming more and more exhausted, with a tendency to faint, or actual occurrence of fainting. There is frequently also vomiting. The skin becomes cold and pale, the pulse rapid and so feeble as to be almost imperceptible, and the breathing gasping or sighing in character. In the other type the onset may be extremely sudden, the patient sometimes falling as if he had been poleaxed, and he may die in a few minutes, or, on the other hand, may survive for hours or days, ultimately either dying or recovering. In this form the skin is flushed, but hot and dry, and the temperature rises rapidly to 106° F. or it may be even as high as 110° F. The heart beats rapidly, the pulse is bounding in character, muscular cramps and twitchings are common, and the patient, if not unconscious altogether, is very frequently confused, and may even be wildly delirious. Such cases are always serious, and, even where recovery occurs, convalescence is slow. After recovery such individuals are found to be unfit to remain in hot climates, being unduly sensitive to heat and unfitted for any strain; there may develop subsequently, even on removal to a cooler climate, mental enfeeblement or actual insanity.

Treatment.—Preventive measures consist in avoidance of undue exposure to the direct rays of the sun, and particularly in the protection of the head and back of the neck by a wide but light helmet. Clothing should also be loose. Marching and other forms of muscular exertion should, as far as possible, be carried out in the cooler parts of the day, with a rest during the warmer hours. Alcoholic and other excesses must be carefully avoided, as these are, perhaps of all factors, the most deadly in predisposing to sunstroke, and on no condition should an individual who has once suffered from an attack be permitted to remain in the tropics. In stokeholds and other such situations proper ventilation will do much to prevent the occurrence of heat-exhaustion, and for troops on the march cold water, if it can possibly be obtained, may be drunk in small quantities at short intervals, and, if there is a sufficient supply, which, unfortunately, can be but seldom, it may be poured over the neck and back. For an actual attack of sunstroke the treatment will depend to a certain extent on its form, but in all cases the patient should be removed to as cool and sheltered a place as possible. Where the symptoms are chiefly those of exhaustion without fever, the patient should be kept lying flat, and the heart's action stimulated by friction of the extremities, and by the administration of alcohol or ammonia, the latter being preferable as the most quickly acting, a teaspoonful of sal volatile being given, and repeated, if necessary, hourly. Where fever is prominent, by far the best results are obtained by the application of cold in some form or other. The patient may be put bodily into a cold bath, the body may be rubbed with ice, or iced cloths may be applied over the body. Failing this, cold water may be pumped or run over the head, neck, and back particularly. This treatment brings down the temperature, and at the same time stimulates the breathing. Where consciousness is not brought about fairly rapidly by this treatment, the head is sometimes shaved, and blisters applied over several places. After recovering from the immediate effects, the patient should be given a purge, such as 2 or 3 grains of calomel. If the respiration is failing greatly or ceases altogether, artificial respiration should be carried on, and hope ought not to be given up until breathing has ceased for half an hour.

Suppression of Urine.—Failure on the part of the kidneys to secrete urine may occur during various feverish ailments, but particularly in acute Bright's disease. It leads to convulsions and the group of symptoms generally classed together as uræmia. (See URÆMIA.)

Suppuration means the formation of pus or matter. This is usually due to germs, and may occur on an open or raw surface of the body, such as in an ulcer or in any form of catarrh, or it may be deep-seated and closed in, when it constitutes an abscess. (For further consideration and treatment see under ABSCESS, CATARRH, INFLAMMATION, and ULCER.)

Suprarenal Glands, Diseases of the.—The most important disease associated with these organs is that known as Addison's disease, in which there is progressive loss of strength and a peculiar darkening or bronzing of the skin. (See ADDISON'S DISEASE.)

Tumours may also develop in these glands, but without any special symptoms other than the presence of a swelling in one or other flank or below the ribs.

Swamp Fever.—A name sometimes applied to ague or malaria. (See MALARIA.)

Sweating.—See under SKIN DISEASES.

Sweating Sickness, or Sweating Fever.—See MILIARY FEVER.

Sycosis, sometimes known as *barber's itch.*—A form of acne affecting the beard region in men, but not always readily distinguishable from ringworm in the same portion of the body. (See under SKIN DISEASES.)

Symmetrical Gangrene.—See RAYNAUD'S DISEASE.

Sympathetic Ophthalmia.—An exceedingly serious form of inflammation, which is apt to come on in one eye after injuries to the other, particularly after injuries involving the iris or deeper portions of the eye. (See under EYE, DISEASES OF THE.)

Syncope, or Fainting.—See FAINTING.

Synovitis means inflammation of the membrane lining the interior of a joint. It may take either an acute or chronic form. (See under JOINTS, AFFECTIONS OF THE.)

Syphilis.—See under VENEREAL DISEASES.

Syringomyelia.—A rare disease in which cavities form in the spinal cord. The chief symptoms are the wasting of certain muscles, particularly the muscles in the ball of the thumb and palm of the hand; more or less complete paralysis of the legs, with rigidity; and a curious affection of sensation, particularly in the hands and arms, whereby sensibility to ordinary light touch is retained, but the power to perceive pain and heat and cold is lost. One result of this is that burns and injuries of the fingers may readily occur without the individual being in the least aware of them. The disease is one which is sometimes slowly progressive; in other cases the symptoms do not get worse. Very little can be done in the way of treatment, although some good results have been reported from the application of X-rays over the spine.

Tabes.—This term means really a wasting disease, and it is now used chiefly in connection with two conditions—namely, tabes dorsalis or locomotor ataxia, and tabes mesenterica, which means a tuberculous enlargement of the mesenteric glands in the abdomen. (See LOCOMOTOR ATAXIA, and GLANDS, AFFECTIONS OF THE.)

Tachycardia means rapid heart's action, a condition which may be due to intrinsic heart disease, or may occur in other affections, such as exophthalmic goitre. (See under HEART, DISEASES OF THE.)

Tæniæ, *i.e. tape-worms.*—See under PARASITES.

Talipes is the technical name for club-foot.—See under DEFORMITIES.

Tape-worms.—See under PARASITES.

Taste, Affections of the Sense of.—The sense of taste may be temporarily lost when there is any inflammation of the mouth or tongue, and also, to a certain extent, in colds and other nasal affections, the two senses of taste and smell being very closely allied. More permanent loss of taste occurs in certain nervous diseases, when the special nerves for the perception of taste going to the tongue are affected; in a few rare cases there may be abnormal taste sensations perceptible without the presence of any article calling them forth. In these nervous affections the taste may only be lost on one side of the tongue, and it may not be perceived by the person unless its loss is specially tested for by the application of sweet or bitter articles (such as sugar and quinine) on one half of the tongue with the tongue protruded. It is useless to test for altered sensibility with the tongue within the mouth. No special treatment is, as a rule, required.

Teeth, Affections of the.—The appearance of the teeth is sometimes of value in the diagnosis of general diseases, quite apart from any special affection of the teeth themselves. Thus, in rickety children the teeth are late in coming through, and also, although to a less degree, in all children who have been brought up on the bottle. Early appearance of the milk teeth, on the other hand, is not uncommon in children suffering from hereditary syphilis, and in the same disease the permanent upper two middle teeth are usually widely separated and peg-shaped, with a notched edge. In rickets the teeth also tend to decay early; but decay of the teeth in children may be due, on the other hand, to neglect, to acid medicines, or, most commonly, to excessive use of sugar and sweets. Bad teeth are also frequently associated with indigestion. Grinding of the teeth during sleep in children is popularly attributed to worms. It may be caused by the presence of these parasites in the bowel, but much more commonly it is simply the result of some catarrh of the stomach or bowels. It also occurs, without any such cause, in nervous children and in certain definite diseases of the nervous system, particularly meningitis, water on the brain, and St. Vitus' dance.

Teething.—When children are cutting their teeth there is apt to be a condition of local and general irritability, and to the lay mind nothing, perhaps, plays a more important part in the production of infantile diseases than teething. Vomiting diarrhœa, skin eruptions, convulsions, and almost any disease, are commonly attributed to teething. This, however, is in most cases a great mistake. In healthy children the cutting of the teeth produces almost no symptoms whatever, or, at most, merely a little congestion of the gums, with increased flow of saliva, slavering, and a tendency by the child to be constantly rubbing the part of the gum above the cutting tooth. There may also be some loss of appetite and restlessness, but, where vomiting and diarrhœa occur, some other cause, particularly improper food, must be looked for. In weakly children, however, teething may be the immediate cause of even such a serious condition as convulsions, but in this case it is of much more importance to treat the underlying disease or weakness than to put all the blame on the cutting of the teeth, and only to facilitate that. Naturally, of course, if the child is troubled by any other source of irritation at the time teeth are being cut the symptoms may be aggravated. Vaccination, for instance, should not be postponed so late as the period of cutting the first tooth. Alleviation of the irritation may be obtained by allowing the child to chew or bite on some hard object, such as a chicken-bone or a penholder of plain unpainted wood, but we cannot too strongly deprecate the use of the all too familiar and constantly used comforters in the shape of bone or rubber rings. These articles are not of the shape suited to a child's mouth, and in many cases lead to the production of misshapen teeth, gums, and even jaws. In a few cases, where there are convulsions or very great restlessness, the gums may require to be lanced over the cutting teeth, or some soothing remedy, such as bromide of potash, may be given to the child; but here again a word of warning must be given against the too common use of teething powders and soothing syrups, many of which contain opium or other narcotic drugs, which quieten the child indeed, but at a very considerable risk, and with what may be permanent deleterious effects on its health.

Toothache.—By far the commonest cause of toothache is decay or caries of the teeth, a condition which is discussed separately below. Toothache may also be caused by gumboil, which is an inflammation of the gums near the root of a tooth, but produces, however, a pain usually of a duller character than toothache due to decay of the teeth. Toothache may result from the accumulation of secretions between the gums and teeth when the mouth is not kept clean, a condition which may go on to the formation of an abscess around the root of a tooth. When this forms, the tooth or teeth particularly affected become tender to pressure, and biting on them becomes impossible. When the inflammation spreads, as it frequently does, into the softer tissues of the gum, the latter becomes swollen, but there is almost immediate relief of pain. Toothache is usually associated with, if not actually due to, such general causes as indigestion and pregnancy. Where any such condition is present, an attack of toothache may be set up by exposure to cold, or by any particularly hot or cold drink, also by sweet articles of food.

Caries or *decay* of the teeth is an extremely common condition. The more civilised a race becomes, the more liable it would seem to be to suffer from decay of the teeth. This growing tendency to decay of the teeth is associated with increased variety of diet, particularly in the greater use of soft articles of food. Amongst savages, who subsist mainly upon hard and coarse foods which require a great deal of chewing, decay of the teeth is hardly ever seen. The mechanical action of chewing, combined with the increased flow of saliva which it produces, effectively removes all trace of food from the surface of the teeth and from the spaces between them. Amongst civilised races, on the other hand, where a great part of the food is fine in quality, thoroughly cooked, and soft in consistence, the necessity for chewing is not present, and the art of proper mastication tends to be lost. The result of this is that food particles on and between the teeth are not dissipated, and the germs which are constantly present in the mouth set up fermentation in them, with the formation of acids, which dissolve the lime of the teeth and so produce decay. This is probably the explanation of 99 per cent. of all cases of decay of the teeth. It will be obvious, from the reasons given, that decay will occur more easily in teeth which are widely separated, owing to the greater ease with which food particles remain between them, also in such diseases as rickets, where the amount of lime in the bones and teeth is deficient; or in regions where the water is exceedingly soft the teeth may be softer than usual, and they are more easily attacked than healthy ones. The importance of good teeth and the prevention of decay cannot be over-estimated. It is not merely the question of preventing decay, but the much more serious one of keeping the individual in good health. Where the teeth are allowed to become rotten, the food cannot be chewed properly, and this in its turn is one of the commonest causes of indigestion; also, where there are decaying teeth in the mouth, the individual is being constantly poisoned by the absorption of poisonous material produced by the action of the germs fermenting in the food and decaying teeth, and a state of more or less chronic ill-health is frequently the result. In many cases anæmia of the most severe kind is directly attributable to the long-continued presence of decayed teeth. The treatment of decayed teeth should be a matter of prevention rather than cure; the prevention must begin with the milk teeth, because they are of just as much importance to the child as the second set is to the adult, and it is therefore of the greatest importance to train a child in the habit of keeping its teeth clean. The teeth should, properly speaking, be cleaned after each meal, and once again, even more thoroughly, before going to bed, because, if any material is left amongst the teeth at this time, there is the whole night for fermentation processes to go on and to start decay. The cleaning of the teeth may be done largely by the use of a sufficiency of hard articles of diet, such as hard biscuits, brown bread, nuts, &c., in the diet, together with thorough mastication. In addition to this the use of hard fruits, such as apples, is to be strongly recommended, and we believe that if an apple, or even part of an apple, is eaten by a child (once it is able to chew properly) shortly before going to bed, very little further cleaning is necessary. We have intentionally left mention of toothbrushes to the last, because the toothbrush, although an exceedingly useful article if properly employed, can do a great deal of harm. Cleaning of the teeth does not, or ought not to, consist in such hard scrubbing with a toothbrush that the enamel on the surface of the teeth is rubbed off, as not infrequently happens when hard toothbrushes, and toothpowders containing silica—a material which is harder than the teeth themselves—are employed. If a toothbrush is to be used at all—and we are far from meaning that it should not be—it ought to be a soft one; and the best kind of powder is also soft, such as precipitated chalk, which will not scrape the teeth, but which at one and the same time mechanically cleanses them and neutralises any acid which may be present. Simple precipitated chalk should be used in preference to any other thing, either mouth-wash or tooth-powder, although there is no objection to it being flavoured, if a pleasant-tasting powder is fancied. Simple rinsing of the mouth after meals is in most cases sufficient, unless the teeth are far apart and irregular, when materials tend to accumulate between them, and in such cases slight brushing with the toothbrush may be employed. The rather more thorough brushing with the toothbrush and powder may be done the last thing at night. In spite of such care, teeth may begin to ache or holes to appear in them, and it is always wise to have one's teeth looked over by a good dentist every six months, or, at the very longest, once a year. It is far better to have this done than to wait for actual decay to occur before advice is sought. Once a cavity has appeared, or where there is severe toothache, the only effective treatment is to have the decayed portions removed and the tooth either stopped or extracted altogether. Rotten stumps, in particular, should never be left in the mouth, nor should they have artificial teeth fitted over them; it may be added that it is better for the individual's health to have no teeth at all than to have a mouthful of bad ones. A word may just be said about the relief of toothache where the dentist's aid cannot be immediately procured, although it must be clearly understood that such relief is merely temporary, and is not in any way to be regarded as a cure of the decay. Where the toothache is due to inflammation or abscess formation between the gum and the tooth, the best application is a mixture of equal parts of liniment of aconite and iodine liniment. The cheek should be held out from the gums, the gum over the affected part dried with a little cotton-wool, and the gum then painted by means of a little plug of cotton-wool dipped in the liniment. Where the teeth themselves are decayed, particularly where there is an actual cavity, a small plug of cotton-wool soaked in oil of cloves, and placed over the affected tooth or in the cavity, is one of the best remedies; or one may use, in a similar fashion, the preparation known as dentalone, which contains oil of cloves combined with certain other substances. Removal of the tooth is, of course, the quickest and perhaps the most certain cure, but it can only be recommended where the tooth is too far gone to be stopped. The teeth should be remembered as common causes of bad breath, neuralgia, and also headache. (See under those headings.)

Telegraphists' Cramp.—See under Cramp.

Tenderness.—See under Pain.

Tendons, Affections of the.—Tendons sometimes become *displaced* during violent efforts, the individual being conscious of a rick with acute pain, followed by a certain amount of loss of power. This accident is most liable to happen to one of the tendons about the elbow, wrist, or ankle. The displaced tendon is usually easily replaced by a little manipulation, but it is very apt to slip out of its position again, and not infrequently requires to be kept in position by strips of plaster, or even by plaster of Paris, for several weeks or even months, until thorough healing occurs. Tendons may also be completely *ruptured* as a result of violent muscular contractions. When such an accident happens—as it may, for instance, in one of the leg tendons while dancing—the patient experiences a sharp, severe pain, and may also feel or hear a snap. On attempting to carry out the movement with which the affected tendon is concerned, loss of power will be noticed. Treatment in such a case consists in having the torn ends of the tendon sutured together, and the same treatment will apply to tendons which have been severed by cuts. *Inflammation of the sheath* of a tendon often follows sprains and strains, being perhaps most frequently met with in connection with the tendons at the back of the thumb. The tendon is swollen, tender to the touch, and painful on movement, and when moved there is experienced, both by the patient and by the observer's hand placed over the part, a characteristic fine grating feeling. The proper treatment for such a case is to keep the part completely at rest for a few days, and to apply poultices or hot fomentations. As soon as the swelling and pain have disappeared, the part should be painted with iodine and massaged, so as to prevent the formation of adhesions between the tendon and its sheath. Chronic inflammation of the tendon sheath—or, as it is called, *teno-synovitis*—may result from repeated attacks of the acute form, or may be due to tubercular disease, in which case it is usually associated with disease in the neighbouring bone or joints. In such cases surgical treatment is generally required. The condition known as "ganglion" is a cyst formation in connection with a tendon sheath, and is most commonly seen about the wrist. (See Ganglion.)

Tertian Fever is the name applied to that form of malaria in which the acute attacks come on every other day. (See Malaria.)

Tetanus.—See Lockjaw.

Tetany means the occurrence of temporary localised muscular spasms in the hands and feet. It is most commonly seen in rickety children, particularly those convalescing from acute fevers or teething. As a rule it is of no particular significance. Occasionally, however, a more severe form occurs, both in children and in adults, associated with acute dilatation of the stomach, and it may then be of grave significance, although no special treatment is necessary for the condition itself. Still another cause may be operation on the thyroid gland in the neck. Where the spasms are very severe, alternating hot and cold baths may be employed, or a little chloroform may be administered. When the condition is due to removal of the thyroid gland, the patient will need to be given thyroid extract.

Thermic Fever.—See Sunstroke.

Thread-worms.—See under Parasites.

Three-days' Fever.—A fever which occurs in Upper India especially, but is in all probability a much more widespread disease, attacking especially newcomers and young persons. It is not contagious from person to person, but is in some way very infectious, for a few hours even in an infected district in the warm weather, when the disease prevails, may be sufficient to bring on an attack. The symptoms come on a variable time after infection, from a few hours to several days, during which interval there may be a general out-of-sorts feeling. Then there is a sudden onset of fever, with headache and pains all over the body, hot, dry skin, sleeplessness, loss of appetite, &c. The symptoms are not very distinctive, and this fever may be confused with malaria, influenza, and dengue, but in about three days the symptoms abate and the attack is over. It leaves considerable weakness, however, and a prolonged convalescence. It is probably identical with the gnat-fever or three-days' fever of the Mediterranean (Pappataci fever of the Adriatic). The treatment consists of rest in bed while the fever is on, plenty of water to drink, and a restricted liquid diet, along with applications of cold cloths to the head, &c., and, if necessary, administration of phenacetin or other such drugs for the headache and pains. (See under HEADACHE.)

Throat, Affections of the.—Under the heading of "Diseases of the Throat" we shall include the commoner affections of the pharynx or throat proper, the cavity into which both the nose and the mouth open, and from which the gullet and windpipe lead to the stomach and lungs respectively. We shall also include the affections of the larynx, or upper portion of the windpipe, and those of the gullet.

One important disease of the pharynx is that known as *adenoids*, a condition met with in children, consisting of an overgrowth of the tonsil-like tissue at the back of the nose and in the upper part of the pharynx, and which is often associated with enlarged tonsils. This condition, which is exceedingly common, and which gives rise to a number of symptoms, amongst which perhaps the most obvious is persistent mouth breathing, is described separately under ADENOIDS.

Acute Catarrh of the pharynx is usually but part of an ordinary cold in the head, although the pharynx may be alone or principally affected. The chief symptoms are pain in the throat, especially on swallowing, and ache in the neck, and, on looking into the mouth, the wall of the pharynx at the back of the mouth will be seen to be swollen and red. The treatment is very much the same as that of an ordinary cold in the head, but, where the throat is sore, it will be advisable to apply cold compresses to the neck, and to use a gargle composed of borax 24 grains, glycerine and tincture of myrrh half a drachm each, in an ounce of water; or krameria lozenges may be sucked. These remedies are most efficacious in the earliest stages, and may prevent the attack from developing. Should they not succeed in stopping it, a gargle of chlorate of potash, 12 grains to the ounce of water, or chlorate of potash lozenges, will be found more satisfactory.

Chronic Pharyngitis, sometimes called "relaxed throat," is a commoner, and at the same time a more difficult, condition to treat than acute pharyngitis. It frequently occurs in persons in whom there is any obstruction in the nose interfering with nasal breathing, and also in persons whose occupation exposes them to irritating vapours or dust, and also in those who indulge too freely in spirits or in tobacco. It may also result from over-use or faulty production of the voice, and in this case is commonly associated with chronic laryngitis, and sometimes goes under the name of clergyman's sore throat, being common in clergymen, teachers, singers, and others who have to speak a great deal. The appearances seen at the back of the throat when the tongue is held down vary somewhat. A series of granular bodies, not unlike grains of sago, may be visible, and the veins are frequently congested and prominent. The symptoms are stiffness and dryness of the throat, a sensation as if some foreign body were constantly there, leading to hawking and coughing, and when speaking the voice usually becomes tired and husky. The treatment required must be general as well as local. Avoidance of stuffy and overheated rooms is of great importance. Where there is obstruction in the nose this will require to be removed. A dose of salts is usually beneficial, and in many cases a course of treatment at some spa is advisable. Locally, innumerable applications have been employed; perhaps the most generally useful is that known as Mandl's paint:

℞ Iodine	6 grains
Potassium iodide	20 grains
Oil of peppermint	5 drops
Glycerine	1 ounce

The back of the throat may be painted with this once a day. In severe and chronic cases it is often advisable to have the pharynx cauterised. Wherever use or misuse of the voice is largely to blame, treatment can hardly be expected to bring about a cure unless the voice can be given rest.

Acute Tonsilitis or Quinsy.—The onset of tonsilitis is usually sudden, there being pain on swallowing, which shoots up to the ear. The breath is foul, the tongue dirty, and, on examination of the tonsils, one or both will be seen to be red and swollen. The patient's temperature rises to 102° F. or 103° F., and there is considerable general discomfort and aching in the back and legs. The symptoms become even worse when suppuration or abscess formation around the tonsils occurs, as it does not infrequently. The condition is always a fairly severe one, and it may be alarmingly so. There is also at times difficulty in distinguishing simple tonsilitis from diphtheria, although in diphtheria usually a much more distinct grey membrane forms on the surface of the tonsils; but, where there is any doubt, a swab should be taken of the throat and a bacteriological examination made. Most cases of tonsilitis recover fairly rapidly, but many individuals have a tendency to frequent recurrence, leading to chronic enlargement of the tonsils. The treatment in the earliest stages should consist in steaming of the throat by the inhalation of simple steam from a jug of boiling water, with or without the addition of a little Friar's balsam. This steaming may be done for a few minutes every hour or two. The tonsils may also be painted with glycerine and carbolic acid, one part of carbolic to five of glycerine. Not a few cases of acute tonsilitis are definitely rheumatic in nature, in which case the patient should be given salicylate of soda, say 20 grains, along with 10 grains of bicarbonate of soda. The patient may be made to swallow this powder dry. Much of it adheres to the tonsils, and causes a profuse flow of secretion from them, affording marked relief. The powder may then be washed down with a little water and swallowed. This may be repeated every four hours or so if found to give relief. In all cases treatment should commence with a purge, either a good dose of salts or 20 grains of compound jalap powder. Should there be any indication of abscess formation—which can best be made out by a finger feeling a boggy sort of swelling in the throat above the tonsil, with the appearance of a dark, angry red spot there—it ought to be opened as soon as possible. After an attack of tonsilitis, to diminish the tendency for the disease to become chronic it is advisable to have the tonsils painted daily with the Mandl's paint mentioned above under the treatment of pharyngitis.

Chronic Tonsilitis—or *enlarged tonsils*, as it is frequently called—occurs chiefly in children, and may be due either to repeated attacks of acute tonsilitis, or it may occur along with or from the same causes as adenoids. The symptoms are also similar to those of adenoids, with, in addition, often some difficulty in swallowing. Such children are much more liable to contract fevers than healthy children. They are constantly getting sore throats, and there is also a considerable risk of their suffering from rheumatism and from enlarged glands in the neck, the tonsils being one of the commonest sources of infection with the germs of both rheumatism and tuberculosis. Earache, deafness, and running ears are symptoms which may result from enlarged tonsils. Little need be said about treatment, because practically the only thing to be done is to have the tonsils removed by operation. It is in many cases sheer waste of time to attempt to get rid of them in any other way, such as by gargles, paints, &c., unless the enlargement is of a very mild degree.

Growths may occur in the pharynx or in the tonsils, causing difficulty in swallowing and possibly pain, whilst on examination the growth is usually seen. Some of these growths are of a non-dangerous character, others are of the nature of cancers, but the diagnosis of the nature of the growths can only be made by a doctor, and even then sometimes only when the growth has been removed.

Acute Laryngitis, or Acute Laryngeal Catarrh.—This may come on from practically the same causes as lead to ordinary colds in the head, the most important factors being exposure to cold, raw air, and especially sudden changes from over-heated rooms to cold air. It is also apt to occur more frequently in persons who use their voice a great deal, and, more especially in singers, it may be of very great moment. A very severe form may result from the inhalation of irritating vapours, such as the fumes of strong acids or of strong ammonia. It may occur as an affection by itself, although more often it occurs along with cold in the head or along with bronchitis. The most obvious symptom is huskiness of the voice, going on sometimes to complete loss of the voice, with pain on attempting to speak. The cough is hard and dry in the earlier stages; as the condition is wearing off the secretion becomes abundant, the cough easy, and the voice gradually returns. There is usually also some pain on swallowing food or sputum. As a rule an ordinary attack of acute laryngitis runs its course in a week or ten days, but in severe cases, or if neglected, it may become chronic; and in very bad cases such a swelling of the vocal cords may occur as to threaten the patient with suffocation unless tracheotomy is performed.

Treatment.—The patient should be put to bed, particularly in the case of a child, and a steam-kettle should be kept going in the room to keep the air moist. The addition of a teaspoonful of Friar's balsam to the water in the kettle renders it pleasant and soothing. The use of the voice should be entirely forbidden. A fomentation should be applied to the throat, and warm drinks may be frequently taken. Where the cough remains dry and ineffective, chloride of ammonium lozenges may be sucked, or, better still, this drug may be given by means of an inhaler—special apparatus, however, being necessary for the purpose. Where the attack is noticed very early, painting the throat with cocaine will sometimes be found to cut short the attack altogether, but this procedure cannot be carried out by the patient himself. In severe cases, where suffocation is threatening, the patient becoming livid and breathing even impossible, the larynx may have to be scarified or even tracheotomy performed. In children laryngitis often causes serious symptoms, taking the spasmodic form known as croup, the child being comparatively well during the day, except for some hoarseness and croupy cough, but getting alarming attacks of shortness of breath at night. (See Croup.)

The form of sore throat sometimes called *septic throat* may be an acute inflammation either of the pharynx, tonsils, or larynx, and is commonly due to bad drainage, occurring especially in warm weather. The chief difference between this form of sore throat and others is that the patient looks and feels much worse in general health, and it is, as a rule, of longer duration, lasting from two to three weeks. The following prescription will be found the most satisfactory in the treatment of sore throats of this description:

℞ Potassium chlorate	1 drachm
Liquor of the perchloride of iron	4 drachms
Liquor of the perchloride of mercury	2 drachms
Liquor strychninæ	1 drachm
Glycerine	3 drachms
Chloroform water	to 6 ounces

A dessert-spoonful to be taken every two or three hours until the temperature falls.

Sore Throat.—The term "sore throat" may include acute inflammations either of the pharynx, tonsils, or larynx. Most commonly it is an acute tonsilitis, but we have indicated above the differences in the symptoms resulting from inflammations of those different portions of the throat.

Chronic Laryngitis.—This arises most frequently from repeated or neglected attacks of acute laryngitis. In this condition the vocal cords and the structures in their neighbourhood become thickened and sometimes ulcerated. The chief symptom is alteration in the character of the voice, more especially during vocal feats, such as public speaking or singing, when the voice is found to be slightly hoarse and uncertain, and in singers the voice may crack unexpectedly. In severe cases the ordinary speaking voice may become rough and hoarse, and singing quite impossible. A hawking cough is also more or less persistent. The first essential in treatment is more or less complete rest to the voice, because if its use is persisted in the condition becomes aggravated in spite of all treatment, and, in the majority of cases, after a course of treatment has been undergone, lessons in singing or in voice production will be advisable. The patient's general health frequently requires to be attended to, and change of air to a dry, equable climate is to be recommended wherever possible. The diet ought to be simple, and, in particular, all irritant substances, such as spice, pickles, condiments, and alcohol—especially in the form of strong spirits—should be avoided. Some local application to the throat will be required, either in the form of spray, paint, or inhalation, but the selection of this had better be left to the patient's own physician.

A special form, practically confined to persons using the voice a great deal, is that known as *singers' nodes.* Hoarseness of the throat is again the chief symptom, hardly noticeable during ordinary conversation, but, whenever the patient attempts to sing or has to talk in a loud voice, it becomes rough and uneven, and after a very short time there is so much discomfort that the attempt has to be given up. This condition is due partly to false voice production, but is aggravated by using the voice in ill-ventilated atmospheres. Its distinctive character—the formation of small nodes on the vocal cords—can only be made out on examination of the larynx by means of a laryngoscope.

Treatment.—Treatment may be satisfactory if the voice is given a complete rest and suitable astringents are employed, and in singers especially this method should be employed. The quickest method is to have the nodules removed by forceps, but in singers this should only be carried out as a last resort, owing to the risk of impairing the finer qualities of the voice.

Tumours of the Larynx give rise to practically the same symptoms as those of chronic laryngitis, the diagnosis again being only possible by laryngoscopic examination. Some of them are removable by operation, either inside the throat or through the neck. In hopeless cases tracheotomy is often performed to give relief to the breathing. *Nervous affections* of the larynx may occur apart from any local disease, particularly from affections of the nerves going to the larynx. This, for instance, may occur in cases of aneurism of the aorta, the symptoms produced being partial loss of voice and a peculiar brassy barking cough and noisy breathing. Complete loss of voice is also a not uncommon symptom in hysteria, in which case electrical treatment of the larynx often brings about a cure of the symptom, although it does not relieve the hysterical tendency. *Foreign bodies,* such as coins or pieces of food, may find their way into the larynx—or, in popular language, "go down the wrong way"—giving rise to immediate symptoms of choking. Vigorous smacking on the back, setting up explosive efforts at coughing, may succeed in discharging the foreign body, but where this fails it may be necessary to make an opening into the trachea below the larynx in order to avoid immediate suffocation. The foreign bodies may pass through between the vocal cords down into the windpipe, and lodge in one or other bronchial tube, in which case there is not the same immediate risk of suffocation, but pneumonia may set up or an abscess form round the obstructing substance. In such cases skilled assistance for removal will be necessary.

The *gullet* or œsophagus may be the seat of acute inflammation, leading to pain on swallowing, in the neck, and under the breastbone, which may be so severe as to cause complete inability to take food. This, however, is a rare condition. The most important affection of the gullet is narrowing or stricture, leading, from whatever cause it arises, to pain and difficulty in swallowing. The stricture may be due to a spasm of the muscle of the gullet wall, a condition which is common in hysteria, giving rise to the feeling of a ball rising in the throat, with inability to swallow, and it is one of the most prominent symptoms in hydrophobia. In hysteria a cure of this symptom may usually be obtained by the passage of a bougie or suitable instrument to dilate the spasm. Stricture may also follow upon the swallowing of corrosive acids, or be due to the pressure on the gullet of swellings of various kinds in neighbouring organs. One of the most important of these is aneurism of the aorta, which not infrequently presses upon the gullet and causes increasing difficulty in swallowing; and the possibility of this is one which must always be remembered by the physician when passing a stomach tube or œsophageal bougie, because of the risk of rupturing the aneurism should that be the cause of the stricture. Where the stricture is in the nature of a spasm, it is sometimes possible to dilate it by means of suitable instruments, or, where it is due to pressure from surrounding tumours, &c., these may be removable by operation. Should this be impossible, it only remains to soothe the gullet by such remedies as dilute hydrocyanic acid, 4 to 6 drops in a little water a few minutes before food is taken, or to have an artificial opening made into the stomach, so as to do away altogether with the necessity of swallowing food. A still more serious, and, unfortunately, more common, cause of stricture of the œsophagus is cancer, which may start in any part of the gullet, but is perhaps most common either at its lower end, just where it enters the stomach, or at its upper end, where it opens off the throat. These growths occur chiefly in persons past middle life. They cause great pain in swallowing, often with regurgitation of food and rapidly-increasing emaciation. In a few cases it may be possible to remove the cancer by operation, but, unfortunately, not in very many. The making of an artificial opening into the stomach through which the patient is fed adds months to the lifetime, and also gives very great relief from pain.

Thrombosis means clotting of the blood in the heart or in any blood-vessel during life, and may be due to disease of the blood or of the walls of the vessels. It is especially liable to occur in the blood-vessels of the brain in elderly people with diseased arteries, when it constitutes one form of apoplexy. (See under Brain Diseases.) It may occur in veins as a result of inflammation in them. (See under Veins, Diseases of the.) In the heart it is only liable to occur as a terminal phenomenon in some exhausting disease, when little or nothing can be done for it. In aneurisms the clotting of the blood must be regarded as a salutary condition, being the natural method of repair. (See ANEURISM.)

Thrush is the name given to a white fungus-like growth which may occur in the mouths of children, or even in adults in a very weakly state. (See under MOUTH, DISEASES OF THE.)

Thymus Gland Affections.—This gland is situated behind the upper part of the breastbone. It is fairly large at birth, but gradually diminishes in size with the individual's growth, and its functions are not definitely known. Practically the only disease affecting it is that known as lymphatism, or *status lymphaticus*, in which the gland is abnormally large, and may grow instead of decreasing in size as the child grows. Children with this affection, or adults, if they live to adult age, are peculiarly liable to die suddenly from trifling causes. (See LYMPHATISM.)

Thyroid Gland Diseases.—The diseases due to affections of this gland, which is situated in front of the neck just below and at the sides of "Adam's apple," are described separately under the headings CRETINISM, EXOPHTHALMIC GOITRE, GOITRE, and MYXŒDEMA.

Tic Douloureux is another name for neuralgia affecting one or more branches of the fifth cranial nerve, supplying the face. (See under NEURALGIA.)

Tick Fever.—This is a fever met with in various parts of Africa, the infection being conveyed through the bites of ticks. It is a relapsing fever, and similar in character to the relapsing fevers occurring in other parts of the world. In natives of the affected regions the symptoms are much less severe than they are in newcomers or in Europeans. The symptoms come on in from one to two weeks after being bitten by the infected ticks. It has been observed that the symptoms are usually less severe, or even absent altogether, when there is a severe local reaction around the bite. The symptoms are simply those common to most fevers—viz. rise of temperature to from 103° F. to 105° F., with headache, pain in the back, more intense pain over the spleen, on the left side, feeling of chilliness, vomiting, and often diarrhœa. These symptoms last for three or four days, and end in a sudden crisis, with profuse sweating and fall of temperature below the normal. The patient is left weak, but gradually recovers his appetite and strength. The attack may now be over, but more commonly there are relapses, with return of the original symptoms. These relapses occur at varying intervals, and attacks may extend over several months, greatly reducing the patient's strength.

The best method of avoiding the fever is to keep clear of native huts and rest-houses, where the ticks often abound, always camping at least 30 or 40 yards away from them. There is, unfortunately, no specific treatment known for this fever, but the pains of the early stages may be relieved by phenacetin (10 grains), salicylate of soda (20 grains), or by laudanum (20 drops in a little water), or by some other opium preparation. Vomiting may be treated by ice, champagne, or bismuth lozenges. If the temperature gets very high or the patient delirious, he should be sponged with cold water. The diet is that recommended for fevers generally, and should be as strengthening as possible after an attack or between relapses.

Another fever occurring in America, and spread by the bite of infected ticks, is that known under the various names of Rocky Mountain fever, spotted fever of Montana, tick fever of the Rocky Mountains, &c. This fever is only known at elevations between three and four thousand feet in the districts of the United States extending from 40° N. to 47° N. latitude, especially in Montana and Idaho. The cases occur chiefly in the months of April, May, and June. The symptoms are practically identical with those of typhus fever, to which the reader may be referred for details. Some authorities maintain, indeed, that it is the same disease. The treatment is also the same as that of typhus fever.

Tinea is a technical name for ringworm.—See under SKIN DISEASES.

Tinnitus means noises heard in the ears without any objective cause. It occurs in certain forms of deafness and disease of the auditory mechanism. (See under EARS, DISEASES OF THE.)

Tobacco, Effects of Over-indulgence in.—Tobacco has, in those addicted to its use, a pleasing action on the nervous system, described by some as soothing, by others as stimulating, but it never has, as even its warmest admirer will probably admit willingly enough, any particularly good influence on the circulatory and respiratory organs, and it may have a very bad one. As to what constitutes excess, that depends very largely upon the individual; some, particularly those leading vigorous outdoor lives, can smoke, apparently with impunity and for many years, amounts which would be exceedingly harmful to others. It is generally agreed, however, that smoking as a habit is bad in those whose growth is not finished, and that it is likely to impair the physique. Nausea, giddiness, and vomiting are, of course, the familiar symptoms of smoking too strong tobacco, or from smoking in those unaccustomed to "the weed."

Excessive use, or what might seem to be moderate use in those with a peculiar idiosyncrasy towards tobacco, may lead to such symptoms as palpitation, irregular action of the heart, giddiness, and a tendency to fainting turns, grouped together sometimes as "smoker's heart" or "tobacco heart." "Smoker's throat" is a form of chronic granular pharyngitis (see under THROAT, DISEASES OF THE), with short, irritable cough, hawking, and tendency to huskiness of the voice and sore throat. Dimness of vision, with, in particular, impairment in distinguishing red and green colours, and sometimes going on to complete blindness—"tobacco amblyopia," as it is called—is another of the ill effects sometimes met with. Smoking, even in moderation, is probably one of the causes which leads to degeneration and thickening of the walls of the arteries, and rise in the blood pressure (see ARTERIES, DISEASES OF THE); but, unless the smoking be very excessive, its evil influence in this direction is probably small compared with over-indulgence in food and drink.

The treatment for these conditions is very simple—smoke less, or, what is probably easier to many, give it up altogether. Contrary to popular belief (although not to popular practice), we believe that cigarette smoking, *in moderation*, is the least harmful form of smoking, although, on the other hand, the cigarette is, unfortunately, the form which offers greatest temptation to excess;

so that, taking this and other reasons into consideration, the pipe is perhaps to be recommended in preference. Chewing is undoubtedly the most pernicious as well as the must objectionable mode of indulging in tobacco.

Toes, Affections of the.—For corns, bunions, and crowding in of the great toe upon the others (hallux valgus) from too tight or incorrectly-shaped boots, see under Corns and Bunions.

Hammer-toe is a condition where a toe (usually the second, sometimes along with some of the others, but rarely the big toe) becomes bent like the claw of a hammer on the shaft, so that the individual walks on the extremity of the toe, or even on the nail. It may come on secondarily to hallux valgus (see above), or from wearing short, pointed boots or very high heels, occasionally from paralysis of some of the foot muscles. If taken in hand early, the condition may be remedied by wearing correctly-shaped boots; but, where the deformity has become fixed (and it often is allowed to become so, despite the pain and inconvenience to which the condition may give rise), a little operation will be necessary to put the toe straight.

Severe neuralgic pains sometimes occur about the bases of one or more toes, radiating thence up the limb. This is often associated with a slight degree of flat-foot, or may be due to the wearing of too tight boots and consequent compression of the nerves. To obtain relief complete rest for some time may be necessary, and, when walking is commenced again, it must be in broad-toed boots, and with an instep-pad if there is any flat-foot. In very aggravated cases it is sometimes necessary to have the head of one of the metatarsal bones excised, to give more room and relieve the pressure on the nerves.

Ingrowing Toenail.—This troublesome condition may be caused either by the wearing of too tight boots or by trimming away the corners of the nails too much when cutting them. It is usually the great toe which is affected. The fold of skin at the side grows in over the nail, and gets ulcerated and exceedingly uncomfortable. The treatment consists in the wearing of sufficiently broad-pointed boots to prevent pressure on the nail, and cutting of the nail square across without any trimming away of the corners. Some packing, such as a shred of boracic lint or of aseptic cotton-wool, should also be introduced between the nail and the overgrowing fold at the side, to press it back. This should be changed once or twice daily, and the toe and nail washed clean with boracic lotion to prevent further ulceration. This treatment may have to be persevered with for some little time, but it will generally be successful. If there is much discharge, it may be advisable to get the overhanging folds snipped away a little, or touched with bluestone. Sometimes the nail is so thick that it is impossible to raise the edge sufficiently to introduce the packing. In this case, or in cases where the ulceration is very bad, it is often by far the quickest method to get part of the nail removed under a local anæsthetic.

Tongue, Diseases of the.—See under Mouth, Diseases of the.

Tonsilitis and Enlarged Tonsils.—See under Throat, Affections of the.

Toothache.—See under Teeth, Affections of the.

Torticollis.—See *Wryneck*, under Deformities.

Trachoma.—See under Eye, Diseases of the.

Trade Diseases.—Many occupations from their very nature tend to cause, either directly or indirectly, certain diseases amongst those engaged in them. Most of these diseases are described separately under individual headings, but it may be convenient to group together here the ailments which workers in some particular trades or professions are peculiarly liable to suffer from. Some of these "trade diseases" are due to poisonous substances absorbed in small amounts but over long periods into the system, others are caused by some particular form of strain which the occupation throws on certain organs. The poisons which may be absorbed from handling or working with them are almost legion, but the following are the chief substances which are apt to give rise to symptoms of chronic poisoning amongst workers with them:

Lead amongst plumbers, painters, compositors, type-setters, pottery-glazers, file-cutters, makers of baths and enamel signs, makers of white-lead, &c. (See Lead-poisoning.)

Arsenic amongst smelters, as many ores contain arsenic; makers of sheep-dips; users of green paints and dyes, many of which contain arsenic. The main symptoms are sickness and diarrhœa; running, watery eyes; eczema; and neuritis, with pain and loss of power in muscles, &c.

Phosphorus amongst match-makers, leading especially to disease in the jaw. This is, however, rarely seen nowadays. (See Phossy Jaw.)

Mercury amongst mirror-silverers, thermometer-makers, and felt-hat makers, who use nitrate of mercury. The most striking symptoms are excessive flow of saliva and a fine tremulousness of the hands.

The following occupations include most of those which commonly lead to disability from some peculiar character connected with them:

Boiler-makers, riveters, and artillerymen—frequently become deaf from the constant concussion of the ear-drums.

Clerks, and sedentary workers generally—lateral curvature of the spine from faulty posture of the body. (See Spine, Diseases of the.)

Telegraphists, pianists, glass-cutters, stenographers—muscular cramp of fingers and hands from constant repeated use of the same muscles at the same act. (See under Cramp.)

Miners, watchmakers, engravers, sempstresses—affections of vision from overstrain of the eyes.

Cooks, 'bus-conductors, shopkeepers, and others constantly standing at their work—varicose veins from the effect of gravity congesting the veins in the lower limbs. (See under Veins, Diseases of the.)

Soldiers, athletes, dock-labourers, iron-workers, and others with very heavy manual labour—hernia, aneurisms, arterial degeneration, and heart disease. (See under these headings.)

Drivers, bridge-pier builders, tunnel-workers—paralysis from effects of working under high atmospheric pressure. (See Caisson Disease.)

Glass-blowers and wind-instrument players—bronchitis and emphysema. (For the latter see under Lung, Diseases of the.)

Preachers, orators, and singers—affections of the throat and voice. (See under THROAT, DISEASES OF THE.)

Stone-cutters, steel-grinders, miners (but not coal-miners particularly), cotton- and flax-workers, flour-millers, and others whose work entails working in an atmosphere containing much dust and irritating particles, are specially liable to severe forms of bronchitis, and to secondary infection of the lungs by consumption. "Potter's rot" is a similar condition occurring amongst potters. (See CONSUMPTION, and also *Dust Diseases,* under LUNGS, DISEASES OF THE.)

Tremor—*i.e.* fine tremblings, twitchings, or shakiness—is a symptom which occurs in a number of different conditions. Very delicate tremors or twitchings of muscles may be seen in the early stages of general paralysis of the insane and in progressive muscular atrophy, but they are commoner and more extensive in the simple weakness of old age or after some exhausting disease, also from chronic over-indulgence in alcohol, in lead-poisoning, and in paralysis agitans or the shaking palsy—in which last condition the tremor may become much coarser as the disease progresses. A fine general tremulousness is also present in exophthalmic goitre, becoming worse on any little excitement. Extremely characteristic of the disease disseminated sclerosis is the so-called "intention tremor." In this there is no tremor when at rest, but immediately any movement is commenced, tremor starts in the contracting muscles, and becomes more and more marked as the movement is being completed. Thus, for instance, when a person with disseminated sclerosis tries to lift a glass of water to his mouth, the shaking may be so great before the glass reaches the mouth that the water is all spilt.

Coarser, more irregular tremors or twitching movements are seen in chorea and a few other rare nervous disorders.

Trichiasis means a turning-in of the eyelids and eyelashes. (See under EYES, DISEASES OF THE.)

Trichinosis, or Trichiniasis.—The disease caused by eating "measly" pork containing the parasitic worms *Trichina spiralis.* (See under PARASITES.)

Trichocephalus Disease, or Whip-worm Disease.—See under PARASITES.

Tropical Abscess.—See under LIVER, DISEASES OF THE.

Tropical Diseases.—These are described under their individual headings.

Tropical Liver.—This is a state of congestion of the liver brought about largely through indiscretions in food or drink on the part of Europeans in tropical climates, also by chills. It takes the average European some little time often to realise that he cannot indulge his appetite with impunity to the same extent in warm climates as in the temperate zone, and, until this experience is gained, or if the indulgence be persisted in, in spite of warnings, attacks of tropical liver are likely to be the result. The symptoms are headache, sickness, bad taste in the mouth in the mornings, coated tongue, constipation, tenderness over the liver, and a tinge of yellowness from jaundice, which may become permanent if the attacks are often repeated. The nervous system is also apt to suffer, the temper of the individual becoming of the shortest. There is sometimes a little rise of temperature with the attacks, which may last anything from two to seven days. The condition is much less common nowadays than it used to be, owing to the more moderate habits in food and drink, particularly the latter, which prevail. Plain, simple food, not highly spiced, should be taken, and if any alcohol is drunk, it should be in a very dilute form, Scotch whisky with abundance of water or soda being the least harmful form, probably. Chills are to be carefully avoided, especially at night, and it is a good rule in tropical countries to have flannel night-attire, and in the daytime to wear a cholera-belt round the abdomen, and to be particularly careful to change the clothes when damp. For an actual attack treatment should commence with a dose of calomel (2 to 5 grains in pill or powder form), followed by a tablespoonful of sulphate of soda or Carlsbad salts in a tumblerful of water next morning. Hot fomentations over the liver will relieve the pain and congestion. The diet should be entirely liquid—soups and milk, with plenty of soda to drink, but no alcohol. When the attack is over, more attention will require to be paid to the diet, and the patient should also be advised to take regular daily exercise—riding, tennis, golf, &c.

Tropical Ulcer.—This is a form of ulceration which occurs in all tropical and sub-tropical parts of the world, but particularly in the neighbourhood of Aden and in Cochin-China. The ulcers occur chiefly on the legs, and are often of a large size, deep, and tend to last for months—indeed, they show little or no spontaneous tendency to heal. To secure healing the patient should lie up completely. The foul-smelling, dirty secretion from the ulcer must first be got rid of by several days of keeping the ulcer covered with gauze soaked in some such disinfectant solution as 1 in 1000 corrosive, or 10 per cent. peroxide of hydrogen. The ulcer will then appear of a clean pink colour, and it may then be dusted with iodoform or boracic acid, or covered with lint on which is spread iodoform or white precipitate ointment, or, what is probably the most rapidly acting, 10 per cent. protargol ointment. But whichever of these healing substances is employed, the coverings must be removed once daily, and the ulcer cleaned gently but thoroughly with one of the disinfectant solutions used to clean it originally.

Trypanosomiasis.—See SLEEPING SICKNESS.

Tuberculosis.—This disease, in one or other of its many forms, is probably more widespread and fatal to the human race than any other, although within recent years in many countries there has been a great diminution in the incidence of tuberculosis, due more to sanitary progress than to any new form of treatment. It is a disease which is found in all countries, but certainly occurs more commonly in temperate climes than in the tropics. At high altitudes, where there is abundant sunshine and great purity of the atmosphere, tuberculosis is rare.

The one and only immediate cause of tuberculosis in all its varied forms (see below) is invasion of the tissues or organs affected by tubercle bacilli. Of course there are many conditions of the body and of the mode of life which either predispose to, or are inimical to, infection by the bacilli. These are referred to subsequently. In all probability every one at some time or other, perhaps frequently, either inhales or swallows tubercle bacilli, but every one does not contract tuberculosis. The defensive powers of the body are in many cases quite sufficient to kill the invading organisms, or to prevent their growth within the body. As in the case of planting seeds, it depends partly upon the vitality of the seeds and partly upon the nature of the soil whether there will be any growth or not; so with tuberculosis, only, in this instance, if the soil is good there will be no growth, whereas if the soil is poor—*i.e.* if the individual's resistive powers are weak—growth of the tubercle bacilli is likely to occur. It is probably a fairly common occurrence for the bacilli to gain a temporary footing within the human body, but later on to be killed out before the disease has gone far enough to cause any symptoms. At all events, pathologists tell us that, in any large series of post-mortems made upon bodies of persons dying from all sorts of diseases not tubercular, fully one-third present evidences of old, completely-healed tuberculosis in some part of the body. This fact, although unpleasant to think of in one way, is really very encouraging, as it shows the cure of tuberculosis to be an everyday affair.

Tuberculosis was regarded as contagious in very ancient times, but the real nature of the contagion was first demonstrated by Koch when he discovered the tubercle bacilli and showed their invariable association with the disease. Several different strains of tubercle bacilli undoubtedly exist, but Koch's view that the bovine tubercle bacilli responsible for tuberculosis in cattle cannot cause tuberculosis in man is not generally accepted. It is the case that the human strain of the bacilli is different in several respects from the bovine, and that tuberculosis in man is usually caused by the human strain, but it must be held as proved that the bovine strain of bacilli can cause tuberculosis in man, and probably so can the strains from other mammals, particularly pigs, and possibly even the strains from birds, tuberculosis being a common disease amongst domestic fowls.

The bacilli inside the body are found in all the diseased portions within the chronic inflammatory foci or "tubercles" which they set up. Their behaviour outside the body is of more practical importance to us in discussing the question of infection. Millions of them are thrown off daily in the expectoration of a person with consumption. When sputum dries it becomes dust, and is soon distributed far and wide, and the bacilli contained therein may retain their virulence for weeks or even months. They also remain virulent for a considerable time in water, and freezing does not destroy them. Sunlight, however, has a very potent action on them, strong direct rays killing them in a few minutes if not covered by more than a very thin layer of protective material (such as the mucus of dried sputum). Exposure to the atmosphere apart from the sun is less active, but also acts fairly powerfully in destroying them. Heat, especially moist heat, is a powerful steriliser, five minutes' exposure to a temperature of 70° C. killing them easily. Such disinfectants as carbolic acid (1 in 20 solution) and corrosive sublimate (1 in 1000 solution) can be depended upon for their destruction if given a few minutes' direct contact.

Modes of Infection.—Children practically never inherit tuberculosis—*i.e.* they do not harbour any tubercle bacilli when they are born. The children of tubercular parents do, however, inherit a tubercular constitution, or, in other words, weak powers of resistance against these organisms, and liability to contract the disease on the slightest opportunity. The "soil" is one suitable for the growth of the tubercular "seed." Direct inoculation through the skin occasionally occurs, but only in persons who handle tubercular material, such as doctors and butchers, a form of warty growth occurring at the site of inoculation.

Inhalation is undoubtedly the chief mode of infection, but it has been well remarked that the consumptive in himself is almost harmless, and only becomes harmful through bad habits. The expired air of consumptives is not harmful, only the sputum, which, as mentioned already, contains the bacilli in myriads, and, when it dries, may spread infection broadcast. The necessity for care on the part of consumptives (and, of course, also those with tubercular running sores) that they do not disseminate the infection is therefore obvious, and the risks run by those in close personal contact with tubercular individuals will be apparent.

Infection through the Alimentary Tract.—This is of particular importance in children, in whom a considerable proportion acquire tuberculosis through their food, especially milk. Tubercular meat is also a possible source, but is not dangerous if the meat is cooked, only if it is eaten raw or partially cured (smoked, &c.). The two channels through which infection occurs from food are: (1) The tonsils—infecting the lymphatic channels in the neck and also in the chest, and showing up as "glands in the neck," and often later, or independently, affecting the glands about the roots of the lungs, and thence the lungs themselves, just as badly as if the infection had been inhaled. (2) The intestines—affecting the glands in the attachment of the bowel, and spreading from there to various parts of the body.

One important point to be remembered is that infection often remains latent—*i.e.* is either not recognised at all from the absence of symptoms, or it is thought to be entirely cured, but, when the strength gets in any way run down, bacilli which have for years been lying dormant may become active, and again begin to extend their injurious influence.

Conditions predisposing to Tuberculosis.—Environment is of the greatest importance. Dwellers in cities are much more prone to the disease than residents in the country, more especially those who live in close, dark, ill-ventilated dwellings and work amidst insanitary surroundings. The occupants of prisons, asylums, workhouses, convents, &c., too often also live confined lives, predisposing to tubercular disease. Wet, rainy, ill-drained districts are worse than dry regions.

The appearance of those individuals with hereditary tubercular tendencies is often characteristic. They have long, flat chests and sloping shoulders; the face is either delicate featured with fine skin, short upper lip, and long eyelashes, or coarse, with irregular features and thick lips.

No age is exempt from the disease, but it is most common between eighteen and thirty-five. It commences least commonly between five and ten. Glands, bones, and the meninges of the brain are more commonly the seat of the disease in children than in adults.

Many trades are responsible for its start, especially those which are very dusty, or cause exposure to sudden changes from great heat to cold, or necessitate frequent wettings.

Certain diseases influence infection, especially other diseases of the lungs—*e.g.* neglected colds, pleurisy, measles, and whooping-cough. Diabetes often terminates in consumption, and blows or injuries to joints frequently start off tubercular disease in that neighbourhood. Excessive nursing is weakening, and pregnancy in a tuberculous woman, although it may lead to a temporary arrest of the disease, is generally followed after labour by a rapid aggravation of the condition.

Mitral valvular disease of the heart is said to be antagonistic to tuberculosis, from the congestion of the lungs with blood which occurs in that condition, a feature which is imitated artificially in the mode of treating tubercular joints, &c., by congestive measures, with rubber bandages and other measures. Gout and cancer also seldom co-exist with tuberculosis.

Forms of Tuberculosis.—The infection with tubercle bacilli may be a general one, generally from some older tubercular focus bursting into a large blood-vessel and flooding the blood with bacilli. Such cases, which are fortunately not very common, may give rise to symptoms either like those of typhoid fever, galloping consumption, or meningitis, and are practically invariably fatal within a few weeks at most.

Tuberculosis of the Lymphatic Glands, or Scrofula.—This is a comparatively common form, especially in children. The glands in the neck are those most often affected, next most commonly, perhaps, those about the roots of the lungs, which act as filters for the foreign particles and germs which escape the "phagocytes" or scavenger-cells in the walls of the bronchial tubes. From here infection is apt to burst through into the lungs. The intra-abdominal glands are also not infrequently early affected in children.

Pleurisy and peritonitis are not uncommonly tubercular.

Tuberculosis of the lungs—consumption—is the commonest and most important form of tuberculosis, and in this situation it may run a course of very varying degrees of activity. (See CONSUMPTION.)

Various parts of the intestine may be affected, with ulceration; more often, however, secondarily to pulmonary tuberculosis from the swallowing of sputum, than primarily, despite the not infrequent entry of the bacilli through the walls of the bowel.

The kidneys, bladder, and sexual organs are a fairly common site of tuberculosis, both in the male and in the female, these parts being alone affected or in conjunction with the lungs.

In the skin it causes the disease known as lupus.

In bones and joints it gives rise to caries and cold abscesses. Any bone or joint may be affected, common situations being the spine, the hip-joint, knees, wrists, and ankle region.

Prevention of Tuberculosis.—General measures which are much in evidence at the present day consist in anti-tubercular crusades to educate the public with regard to the facts concerning the disease; notification of cases of the disease, with subsequent readiness on the part of the sanitary authorities to undertake treatment, disinfection, &c., if necessary; improved housing and working surroundings; prevention of spitting; disinfection of rooms where tuberculous patients have been; and inspection of dairies and slaughter-houses (much yet remains to be done in the provision of a proper milk supply for towns, and will probably only be satisfactory under municipal management); establishment of sanatoria for early curable and late incurable cases.

Individual preventive measures are of great importance in the case of delicate children, especially those of tubercular families. Catching cold should be specially guarded against; and this does not mean that they should be kept mewed up in hot, stuffy rooms, but warmly though not too heavily clad, and in the open air as much as possible. On any indication of mouth-breathing or obstruction in the nose examination should be made for adenoids. The throat and chest may be hardened by sponging night and morning with cold water. The food should be plain but substantial, and contain plenty of milk and eggs. In older children a properly-regulated course of breathing exercises and pulmonary gymnastics may be undergone with advantage. In the choice of an occupation, preference should be given to an outdoor one, and, in cases with marked hereditary predisposition, the residence should, if possible, be in an equable, dry, sunny climate. After convalescence from fevers and other childish ailments great care must be taken, and tonics such as cod-liver oil administered.

Treatment.—The details will naturally differ with the site of the tubercular disease and the activity or otherwise in any particular case, but the general principles are always much the same, and may be given here briefly. First and foremost comes abundance of open air, and, if possible, sunshine, for tuberculosis of every kind. The ideal climate is one with a pure atmosphere, an equable temperature, and a large amount of sunshine; but the open-air method may be practised anywhere, although it is not always very easy in cities. Cold, it must be specially insisted upon, is no bar to open air so long as the patient is sufficiently well clad, and this applies to the night as well as to the day. No symptoms contra-indicate full exposure to the fresh air, but if there is fever (temperature rising over 100° F. is generally taken as the limit) the patient must be kept in bed until it falls. Other symptoms may also necessitate more or less complete rest in bed at first.

Feeding is of great importance; an old saying is, "Make the patient fat, and the disease may be left to look after itself." It is certainly rare to get much improvement if the appetite is upset, but it is wonderful how much and how quickly it improves under the fresh air regimen. The diet should be up to the limits of digestion, but no more. Milk is perhaps the most important article of diet: eggs and raw meat or meat-juice are often useful articles with weak digestions, but a full diet may be allowed whenever it can be taken. Cod-liver oil may be regarded both as a food and as a tonic medicine, and is certainly very advisable, especially in bone and gland tuberculosis. There is probably no medicinal substance which has any great curative action, although medicines are often necessary to relieve special symptoms, and, where direct antiseptic action can be obtained (as in abscesses), antiseptics like iodoform, &c., may be employed. Creasote or some of its derivatives, such as guaiacol, have also a slight internal antiseptic action. Surgical measures are, of course, often employed where the disease is in such a situation that it can be eradicated, and splints or other appliances may be necessary to ensure rest to the part. Rest to the lung is sometimes brought about for a period by producing pneumo-thorax artificially—*i.e.* letting air into the chest cavity.

Treatment by passive congestion must be mentioned, also the use of X-rays and other forms of light treatment for lupus. A specific form of treatment applicable to practically all forms is by means of tuberculin. This is a preparation made from artificially grown, killed tubercle bacilli, and it can often be used very satisfactorily in addition to other measures. Tuberculin was the invention of Koch, but for many years was in disfavour owing to the great harm done by its use when first introduced. It can be a most potent agent for ill, and the great mistake made at first was to give it in too large doses. But, when used in minute doses and with suitable precautions, it can be of the greatest value, and is now coming into its own again, and being widely used with very successful results.

Tumours.—A tumour means literally a swelling, but all swellings are not necessarily tumours, the term being generally confined to swellings which are of a permanent nature and are really new growths. These growths serve no useful purpose, and increase in size at the expense of their host, often ultimately to the point of exhaustion and death. Tumours may arise from practically any tissue and in any part of the body, although certain situations are much more affected than others. There need not even be a swelling to constitute a tumour, for in some cases there is more erosion and eating away of tissue than obvious overgrowth. What causes any particular tissue to take on the erratic and purposeless growth constituting a tumour is, in the great majority of instances, unknown. A few forms of tumour are of an infective nature, and can be transferred from one individual to another; others seem undoubtedly to arise at the site of injuries; whilst yet others appear to develop as the result of slighter but more long-continued irritation at some particular spot; but in most cases the cause of the growth is more a matter of speculation than of any certainty.

Tumours are of great variety in their structure and nature, but their classification on a basis of microscopic structure, whilst of the greatest scientific interest, and also of immense practical importance in helping to decide whether they are of a dangerous character or not, cannot and need not be gone into in a work of this kind. From the patient's point of view they may be divided into the dangerous or malignant growths, and the non-dangerous, simple, or benign tumours. The former are generally spoken of as cancers. Unfortunately there is no ready way of distinguishing between these two forms of growths applicable to every case, nor is the division really a very exact one, for there is no sharp dividing line between the two classes. There is no difficulty in distinguishing between the extreme malignant forms, which extend rapidly, invade structures surrounding those from which they start growing, are liable to ulcerate, tend to recur after seemingly complete removal, and with secondary growths in parts far removed from their starting-point; and the simple forms, which grow slowly, perhaps press upon and push aside neighbouring parts but do not invade them, have never any secondary growths, and do not tend to recur after removal, nor yet to ulcerate. Between these, however, there is every grade, the malignancy or otherwise being only relative, not absolute. Again, the nature of any particular tumour may change; after being, it may be for years, apparently of a perfectly simple, benign character, it may take on all the characters of a malignant growth. Appearance, size, shape, symptoms, &c., offer little in the way of absolute criteria. Cancers may be at their commencement of a most innocent appearance—a small wart or ulcer, for instance—and there may be practically no symptoms until the growth is far advanced. Some simple non-dangerous growths, on the other hand, are repulsive in appearance, and their size may be either quite small or enormous. Pain, although very characteristic of cancers in their more advanced stages, may also be present with benign tumours, from their size or position leading them to press on nerve trunks.

The diagnosis must, therefore, in most cases be left to a doctor to make, and even for an expert surgeon and microscopist it is by no means always an easy matter to decide whether any particular tumour is malignant (or how malignant it is), and from that to settle how radical treatment ought to be. He will have to take into consideration not only the appearance of the growth and its microscopic character, but also its rate of growth, the age of the patient, the symptoms, and, it may be, various other factors.

The treatment will be decided on from a consideration of these various factors. Many simple tumours are best left alone, unless from their size, position, pressure symptoms, possible tendency to become malignant, &c., it is deemed wiser to remove them. For cancers there is, in most cases, only one remedy offering anything like a chance of recovery, and that is removal by the knife. A few forms of growth are removable by the use of X-rays, radium, and other such means, and probably such remedial agents will in time become more widely applicable and efficacious—but the time is not yet. We would especially warn our readers against putting off invaluable time by using drugs or any form of local application advertised as being able to cure or remove cancers. There are no such things, and persons vaunting such remedies ought to be treated as criminals. They may temporarily alleviate symptoms, but they do not cure the disease, and their use may be justifiable in late inoperable cases; but, in the present state of our knowledge, it is little less than murder to recommend them in early stages, when the growth is in such a condition as to be removable surgically.

Tunnel-worm Disease.—See *Anchylostoma*, under PARASITES.

Typewriter's Cramp.—See under CRAMP.

Typhlitis means inflammation of the cæcum, or blind first portion of the large intestine into which the appendix opens. It is practically always associated with appendicitis, the importance of which completely overshadows it. (See APPENDICITIS.)

Typhoid Fever.—This fever—caused by a special organism, the typhoid bacillus, which sets up ulceration in the intestine—runs a course, the acute stage of which lasts usually about four weeks. It commences very insidiously with headache, pains in the back, a general weary, tired feeling, and gradual rise of temperature. There is usually diarrhœa, the bowels moving three or four times daily, and the stools being offensive and resembling pea-soup in appearance; sometimes, however, there is constipation instead of diarrhœa. As the fever progresses the patient becomes more and more prostrate and apathetic, the abdomen tender and slightly swollen, and there is commonly a slight but rather typical rash on the abdomen.

The typhoid bacillus occurs in nature in soil contaminated with animal matter, also in water by the soakage of sewage into wells and streams. Infection is therefore liable to occur from drinking contaminated water, eating vegetables washed in unboiled water, or ice, milk, cream, butter, &c., contaminated by infected water, also from oysters and other shellfish which have grown on sewage-contaminated shores. It may also occur through the inhalation of dust in which there is dried-up matter from the stools of typhoid patients (this was probably a common mode of infection in the South African war), or from food to which the bacilli have been conveyed on the feet of flies which have previously been feeding on the excreta of typhoid patients. Direct spread from the sick to those in attendance is rare, and should practically never occur if precautions as to cleanliness are observed. The disease occurs in all climates, but not so abundantly in tropical as in sub-tropical and temperate countries. Persons of any age may be affected, but it occurs chiefly between the ages of five and thirty-five, more particularly in young adults. An attack confers immunity for two or three years, but not for longer. Individuals who have typhoid sometimes harbour the bacilli within their intestine for years afterwards with no harm to themselves (or, at least, not necessarily), but these "typhoid carriers" are a great danger to the community in their neighbourhood, since they may spread infection wherever they go and be responsible for outbreaks of the disease.

Symptoms.—There is an incubation period of from one to three weeks in length, during which time the individual may feel slightly out of sorts, without knowing exactly what is the matter. Then for about a week there is the insidious onset of fever, the temperature steadily rising, but the morning temperature being always rather less than that in the evening. The patient feels tired and weary, with pains in the back and limbs, and headache; he is restless at nights, and often there is slight bronchitis and cough. The tongue is coated at the back and down the middle, but is bright red at the tip and edges. By the end of the week he is generally floored and has to take to bed, and the appearance is now fairly characteristic. There is a look of peculiar depression and apathy, the cheeks are slightly flushed, but the lips are dry and parched, there is great thirst, and usually headache is still complained of. The bowels by this time are generally moving several times a day, the motions resembling pea-soup in appearance, and being very offensive, but sometimes there is obstinate constipation. The abdomen is somewhat distended and usually tender, especially low down on the right side, and the spleen, which is enlarged, may be felt below the ribs on the left side. The pulse is not so rapid as the degree of fever might lead one to expect, being usually only between 100 and 120. The skin is dry, and the urine is small in amount and high-coloured. Bleeding at the nose is not uncommon. The rash usually appears some time during the second week; it does not thrust itself on one's notice, but has to be looked for, and is usually best seen on the front of the chest and abdomen. It consists of raised rose-red spots, of which there may be from half a dozen to a score present at one time; each lasts for about three days, but they may continue to come out for two or three weeks.

In the second and third weeks the symptoms are more severe. The patient becomes prostrated and emaciated, the lips are dry and cracked, the tongue glazed and fissured, and the face dusky in colour. There is often congestion of the lungs, which may pass into pneumonia. Delirium of a low muttering type is common, and in severe cases the patient may pass into the so-called "typhoid state," in which he is quite stuporose, sinks down in bed, picks at the bedclothes, passes his motions involuntarily, develops bedsores, and in most cases dies. Death from hæmorrhage or from perforation of the bowel is also liable to occur in the third and fourth weeks. The diarrhœa is usually at its worst in the third week, and the motions are frequently tinged with blood derived from the ulcers, which are separating at this stage; but, so long as large clots or profuse hæmorrhage does not occur, this does not matter. In the fourth week the symptoms begin to improve, the temperature falling gradually, the tongue clearing, the stools becoming more natural in appearance and odour, the appetite returning, and the patient generally feeling better. The ulcers in the intestine are still, however, far from being completely healed, and relapses may easily occur from, or even without, any indiscretion in diet. Relapses are fairly common, especially within fourteen days of apparent recovery, and in them all the original symptoms may be repeated.

Complications.—Severe hæmorrhage from the ulcers is indicated by the patient becoming suddenly blanched, the temperature falling, and the pulse-rate rising. The blood does not always appear externally, or, at least, not for some little time. If very large it may lead to collapse and even death.

Perforation of one of the ulcers into the abdominal cavity is fortunately rather rare. It is indicated by the occurrence of sudden severe abdominal pain, at first localised to one spot, but soon spreading all over the abdomen with the development of peritonitis. The temperature rises, the abdomen becomes greatly distended, the face pinched, vomiting sets in, and death almost always occurs within one or two days.

Pneumonia is not uncommon, from the beginning of the third week onwards. It is always a serious complication, but not necessarily a fatal one.

Inflammation in veins (phlebitis), especially in the veins of the lower limbs, is fairly common. (See under VEINS, DISEASES OF THE.)

The diagnosis of typhoid fever, especially if it be an isolated case and not one of a general epidemic, may be a matter of considerable difficulty, as may easily be gathered from the gradual nature of the onset and vagueness of the early symptoms. It is practically never possible to diagnose it with certainty before the end of the first week of definite illness. A test which gives great help, but which also is not available before this period, is that known as the Widal test. It consists in drawing off a few drops of the patient's blood and testing the behaviour of typhoid bacilli when mixed with the serum of the patient's blood.

Varieties.—Abortive cases occur, in which the patient is only ill for one or two weeks and then rapidly recovers.

There are also "ambulatory" cases, in which the patient never feels so ill as to compel him to take to bed. He suffers perhaps simply from some diarrhœa and feeling slightly unwell. He keeps on ordinary food all the time, and such cases run very considerable risk of perforation or severe hæmorrhage occurring. Both these types of cases are also very dangerous from the way in which they spread infection about.

Very severe or malignant types are also known, in which all the symptoms are severe and more rapid in their development, and are frequently fatal as early as the second week.

Treatment.—The prevention of typhoid fever is largely a question of obtaining a pure and uncontaminated supply of drinking-water, and, where there is any doubt on this point, all water used for drinking or cooking purposes should be boiled or filtered through a reliable filter, such as a Berkfeldt or Pasteur-Chamberland. Other precautions which should be observed are sufficiently obvious from a perusal of the conditions mentioned as responsible for causing attacks. When dealing with a typhoid patient, the stools and urine must be mixed with equal quantities of 1 in 20 carbolic or 1 in 1000 corrosive sublimate lotion, and allowed to stand for an hour before being thrown down the drains. The sheets and bed-linen must also be similarly disinfected, and nurses must be careful to disinfect their hands after attending to patients. If they do this thoroughly, they run practically no risk of acquiring the fever, but if they do not, they are very liable to get it.

Inoculation against typhoid is now very commonly practised, and with marked success, although the degree of immunity conferred is not so perfect nor so long-lasting as, for instance, in the case of vaccination against small-pox. The inoculation is done by injecting hypodermically a number of killed typhoid bacilli; usually two doses are given, at an interval of about ten days, the second dose being double the first one. After the first dose there is considerable local discomfort and some general seediness, but little or none after the second. For persons going to an infected area the procedure is decidedly to be recommended. The protection afforded usually lasts about two or three years.

The treatment of an actual case is in most cases largely a question of good nursing rather than of "curing" the disease by drugs, &c. Attempts have been made to cut the disease short by the use of intestinal disinfectants, but it is now generally admitted that this cannot be done. The patient must be strictly confined to bed, and not even allowed to sit up, during the four weeks or so of the acute stage. All feeding and the use of the bed-pan must be carried out in the recumbent position. The skin, especially of the back, must be kept in good condition by frequent sponging with tepid water and by rubbing with methylated spirit. The mouth must also be frequently cleaned by being swabbed out with a little cotton-wool soaked in some antiseptic lotion, such as a mixture of equal quantities of boroglyceride and glycerine. The patient should be encouraged to drink frequently of water, to the extent of at least 3 or 4 pints a day, and may also be allowed a little weak tea, but no aerated drinks should be given. The diet is in most cases one of milk pure and simple, about 3 ounces being given every two hours. This is better given diluted about half with water. If solid milk-curds appear in the motions, cut down the amount of milk a little. If there is no diarrhœa, a little beef-tea may be given, especially hot at night, when it may aid sleep. If there is much diarrhœa, the milk may be diluted with lime-water instead of ordinary water. If there is great prostration, alcohol may have to be given freely, up to 4 or even 8 ounces per diem. The first addition to the dietary may take place when the temperature in the morning first comes down to normal, but the increase must be very cautious, as it is easy to cause relapses. Jelly, arrowroot, egg-flip, or oat-flour porridge may be the first additions, then steamed white fish, bread and butter, and, by the time the temperature has been constantly normal for a week, chicken may be allowed. The appetite of the patient in convalescence is enormous, and always outruns what it is safe to give, and patients must be very closely watched owing to the great temptation to take too much or what is unsafe from the risk of perforation (fruits with seeds, for instance). Constipation is to be treated by castor oil, or by washing out the bowel with large enemata of hot water. The temperature should never be brought down artificially by the use of drugs, such as quinine, antipyrin, &c., but, whenever it goes above 102·5° F., the patient should be sponged with tepid water, or he may be put bodily in a bath and the temperature of the water gradually lowered until the patient is almost shivering. Treatment by cold baths is a routine measure in some countries, but it is not very convenient to carry out in a private house, and equally good results can be obtained by the patient drinking plenty of water and being sponged if necessary. Should hæmorrhage occur, the patient must be kept absolutely quiet, even to the extent of being permitted to pass the motions into the draw-sheet. He should be given some opium or laudanum, and starved absolutely for a day or so. When perforation occurs the chances of recovery are very slight, and practically the only hope is to have the abdomen opened and the perforation closed, but naturally the risks of such a severe operation under such circumstances are great. In convalescence the patient should not be allowed to sit up in bed until some days after the temperature has been steadily normal, and exercise for some weeks must be very cautious. An attack of typhoid fever means at least three months knocked out of one's active life.

Typhus Fever.—This fever is one which occurs along with conditions of dirt, destitution, and overcrowding, and in the old days was common in camps and jails, but it is now very largely stamped out through sanitary improvements. It is exceedingly contagious, and, once an epidemic has started, any one coming near infected persons is liable to contract the disease. The germ is unknown, although the fever has been shown to be capable of being spread through the bites of lice.

The onset is sudden, with a feeling of chilliness, rigors, headache, and severe pains all over the body; the face becomes flushed and of a dusky hue, and the general expression is that of a drunken person. The temperature rises rapidly to about 104° F., and the patient has to take to bed usually before he has been a day ill, and often with delirium even so early in the attack. A rash appears, usually about the fourth day, coming out first on the trunk, on the backs of the hands and elbows, later, and to a less extent, on the face. It consists of raised, dusky, mottled spots, often described as resembling mulberries; and, since hæmorrhages occur in the centre of the spots, they do not fade out entirely when pressed upon with the finger. The patient remains delirious or dazed, or even torpid, and of a dusky hue, up till the time of the crisis. The tongue is dry and brown, and the body generally has a peculiar mousey odour. The crisis usually occurs about the twelfth or thirteenth day, the temperature dropping quickly, the patient sleeping comfortably, and waking free from delirium, perspiring, with a moist tongue and an appetite, and, in a favourable case, recovery is rapid. The disease, however, is frequently a very severe and fatal one, death occurring from extremely high fever, heart-failure, congestion of the lungs, &c. Immunity against any subsequent infection is given by an attack of typhus.

Treatment.—The patient should be isolated, along with those in attendance, for five weeks from the appearance of the first symptom. All "contacts" should be kept strictly quarantined for a fortnight, by which time it will be certain whether or not they are going to contract typhus. For the safety of those in attendance it is essential that treatment should be conducted as nearly as possible in the open air. If in a house, the room must be large, and the windows should be wide open. Tents do excellently. The patient must be encouraged to drink water freely, so as to dilute and wash out the poisons in the blood. It is important to see that the bladder is emptied regularly, and with unconscious patients the water has usually to be drawn off. Cold or tepid sponging should be done at least twice daily, and oftener if the temperature is very high and there is much delirium. The diet should consist of milk and strong soups, given every two or three hours. Stimulants require to be given in the great majority of cases. If there is sleeplessness or wild delirium, it is advisable to give some such drugs as chloral and bromide of potash (20 to 30 grains of each dissolved in water), or else opium or morphia, along with some digitalis, as a heart tonic. If there is fear of heart-failure, a strong, rapidly-acting heart stimulant is 4 grains of camphor along with 10 grains of musk. For congestion of the lungs 10 drops of oil of turpentine may be given on sugar, along with a teaspoonful of sal volatile in a little water.

Ulcers.—An ulcer may be defined as the result of inflammation occurring on a free surface, whereby death of a part of the tissue occurs, and an open sore, usually taking the shape of a rounded, depressed area, forms, and discharge takes place from it.

Ulcers may result from any form of irritant applied to the skin or other surface on which the ulcer may be, and this irritant may be either chemical, thermal, physical, or infective. As examples we might quote the action of strong acids on the skin, or hyper-acidity of the stomach, as a factor in the causation of gastric ulcer; of hot metals, or of extreme cold, such as carbonic acid snow; of severe pressure or friction; and, commonest of all, of disease germs. Other factors which often aid in the development of ulcers are poorness of the blood, general weakness of the constitution or bad health, or a defective condition of the circulation, as in the legs of persons with varicose veins. Ulceration is also liable to occur in parts whose nerves are diseased or interfered with, as, for instance, bed-sores, and on the eye after operations on the fifth cranial nerve for persistent neuralgia, &c., or on the sole of the foot in persons with locomotor ataxia. Lastly, where there is any malignant growth, cancer or sarcoma, it is always liable to break down and ulcerate.

Ulcers are usually rounded, depressed areas with a base covered by bright-red "granulations," which consist of repair tissue trying to make good the loss of substance, and an edge at which the ulcer is either extending or from which there is taking place an ingrowth of skin (or mucous membrane, if the ulcer is on a mucous surface), to cover over the granulations and complete the repair. This healing edge usually shows up as a bluish line. There will be more or less discharge from the ulcer, according to the stage in which it is.

Ordinary simple inflammatory ulcers, as distinguished from infective and malignant ulcers (see below), run through three stages, which must be described individually as a guide to proper treatment. (*a*) The first stage is that of extension or ulceration proper. In this the surface or floor of the ulcer is covered with dirty grey or yellow material, from which there is abundant, often offensive, discharge; there are no red granulations yet present. The edge of the ulcer is sharply cut and well defined, and the surrounding parts are usually red and swollen. (*b*) In the second stage the destructive proeess has ceased. The ulcer becomes cleaner, the discharge less abundant and more watery in character; the parts around become less brawny and angry-looking, and the base more or less covered with red granulations. Most chronic ulcers which are neither spreading nor actively healing may be included in this stage. These include *callous ulcers, irritable ulcers, weak ulcers,* and *varicose ulcers. Callous* or *indolent ulcers* are the commonest type of chronic ulcers, and they occur chiefly on the legs of women in middle life, but they may also follow on burns. They are often of considerable size, involving even the whole circumference of a limb. Their surface is smooth and glistening, and with few granulations; the edges are hard, thick, and elevated above the surface; the discharge may be slight or fairly abundant, but is often offensive and irritating, so that an eczematous condition develops on the skin around. *Irritable ulcers* are only peculiar in that they are excessively painful, especially at night. They are commonest about the ankle. *Weak ulcers* are met with in weakly individuals, especially dropsical persons; in this type the granulations project above the surface, being commonly called *proudflesh.* They are soft, bleed easily, and, from their prominence, prevent the healing edge growing inwards and covering the ulcer. *Varicose ulcers* may belong to any of these types, but are generally of the callous variety. They are met with on the legs of patients with bad varicose veins, and with them there is great risk of a vein rupturing and severe hæmorrhage occurring. (*c*) The third stage, where repair is in full progress, is that of the healing ulcer. In this there is a smooth, even surface shelving gradually from the skin, and covered with clean red granulations. The edges show the typical bluish line of advancing skin, and there is no brawniness around the ulcer.

Infective ulcers occur in such diseases as soft chancre and syphilis in all its stages (see under VENEREAL DISEASES); also in tuberculosis, either from the bursting of a tuberculous abscess or in the cutaneous form of tuberculosis, lupus; in anthrax (malignant pustule), actinomycosis, Oriental sore, and yaws.

Malignant ulcers are apt to develop where cancers either start in, or spread so as to involve, the skin. Chief amongst these may be mentioned rodent ulcer—seen usually on the skin of the face (see RODENT ULCER)—and cancer of the lip and tongue.

Internally ulcers are specially liable to develop in the mouth, stomach, and intestines. (See under these headings.)

Treatment.—The infective and malignant ulcers require to be treated on special lines, which are indicated under their respective headings, as are also the lines of treatment suitable for internal ulcers.

For ordinary inflammatory ulcers the treatment will depend upon the stage at which the ulcer is, but, in every case, the more the part on which the ulcer is situated can be kept at rest the better. This is particularly the case with ulcers on the legs, which are often very troublesome, or even impossible to get healed, if the individual has to be standing or walking about; the leg should not even be allowed to hang down. The patient should be in bed, and, in the case of varicose ulcers, the leg should be raised on pillows so as to be higher than the heart. Inflamed and extending ulcers must first of all be rendered clean with moist, warm, antiseptic applications, such as a boracic poultice or cloths soaked in 1 in 40 carbolic lotion, or 1 in 1000 corrosive lotion, and covered with oiled silk to prevent evaporation. If there is a very offensive discharge, a poultice made of equal parts of linseed-meal and charcoal may be first employed. A purgative to the patient will in most cases be advisable also. As soon as the ulcer is rendered clean by this regimen, these antiseptic applications must be stopped, as they impede healing, and the measures applicable to a healing ulcer employed. Chronic ulcers are those which are most difficult to render healing in character, and sometimes require prolonged measures. In all the importance of complete rest cannot be too strongly insisted upon. In the case of "weak" ulcers, or any ulcer in which the granulations are too prominent and above the level of the surrounding skin, the granulations may be lightly touched all over with a nitrate of silver stick or a crystal of "blue-stone" (copper sulphate), and the ulcer may be dressed with the well-known "red lotion," which has a stimulating action. The patient may require good nourishment or general tonics.

Callous ulcers, if necessary, are first of all cleaned in the same way as a spreading ulcer. The thickened margins may then be rendered healthy either by blistering, or by pressure applied by means of a Martin's rubber bandage. The ulcer may be covered with lint on which is spread boric ointment, while the bandage is applied from the foot up to the knee fairly tightly, but a little looser actually over the ulcer than elsewhere. This may be kept on all day, but should be removed at night. Another and probably quicker method employed nowadays to dissolve the callous edges is by exposing the ulcer to hot air (at a temperature of about 75° C.) inside a suitable box. In cases where the patient positively cannot lie up, fairly good results may be obtained by the application of zinc-gelatine paste, melted and allowed to set round the leg, but this can scarcely be applied except by a doctor. This form of treatment is also applicable to varicose ulcers; but, if there are bad varicose veins, the results are scarcely likely to be permanent unless the veins are efficiently dealt with by operation, support alone being seldom sufficient. In the case of a large chronic ulcer, once it has been rendered healing in type, recovery can frequently be materially hastened by skin-grafting. Irritable ulcers are probably best treated by being thoroughly scraped under an anæsthetic, although sometimes touching with caustics, or having the specially tender spots cut with a knife so as to destroy the sensitive nerve-endings, may be sufficient. Instead of applying ordinary dressings, which tend to keep up the irritation, the ulcer may be simply washed and kept clean with boracic lotion once daily, and in the intervals covered with a glass or celluloid shield, kept in position by strips of adhesive plaster.

The treatment of a healing ulcer—and it is one's aim to render all ulcers "healing" ones—is simple in the extreme. All that is necessary is to keep the surface clean and free from irritation, and Nature will do the rest. The part must be kept as quiet as possible, and, in the case of the leg, not allowed to hang down. The ulcer may be kept covered with a piece of lint spread over with boracic ointment, care being taken to remove it very gently when changing, so as not to disturb the healing margin. This dressing should be changed every two or three days, or daily if there is much discharge, and the ulcer gently washed clean with warm boracic lotion. All dressings are sometimes dispensed with and a shield used, as described above.

Uncinariasis is another name for anchylostomiasis, a disease of which one of the main symptoms is severe anæmia, and which is caused by the presence of hook-worms in the upper part of the small intestine. (See under PARASITES.)

Unconsciousness is not a disease *per se*, but a condition which may come on from a number of different causes directly or indirectly affecting the brain. It is of the greatest importance that the cause of the unconsciousness should be determined before commencing to treat any particular case. The diagnosis of these will be found in the section of the book dealing with First Aid, along with appropriate first-aid treatment. The nature of the subsequent treatment will be found under the headings of the various conditions leading to unconsciousness. (See also COMA.)

Undulant Fever.—See MALTA FEVER.

Uræmia.—This means the train of symptoms which are apt to come on when the poisonous substances normally voided in the urine are not excreted properly, but are retained in the blood. The chief of these are nausea, vomiting, and diarrhœa; headache; shortness of breath, rather like asthma in character, the breathing having a peculiar hissing quality; muscular twitchings; a tendency to convulsions and mental excitement, going on to coma and often death.

The condition most commonly comes on in chronic Bright's disease, less commonly in the acute forms, but may also occur in other diseases of the kidney, such as tubercular disease, waxy degeneration, stone in the kidney, &c., and also in association with suppression of urine, which occurs sometimes without any actual disease of the kidneys. There is usually some immediate exciting factor responsible for the attack of uræmia. This may be exposure to cold, overwork, imprudence in diet, or, in short, anything which throws a special strain upon the kidneys of a person with some one or other of the foregoing conditions.

Attacks of uræmia are sometimes classed as *acute* or *chronic*. The acute forms come on in a few hours or days without any previous warning; in the chronic forms the symptoms are similar, though less severe—they are, indeed, very largely those of chronic Bright's disease, but liable at any moment to develop into the more severe or acute form, so that there is really no sharp dividing line between the two forms. The chief symptoms of uræmia have been mentioned above, but these symptoms are seldom all present at one time, some one or other being usually the most prominent. In some the attack commences with twitchings, headache, and restlessness, going on to convulsions and unconsciousness. The restlessness occasionally amounts to actual delirium, with absolute sleeplessness. The asthmatic-like breathing, nausea, vomiting, and sometimes hiccough, are common. In some cases the onset of unconsciousness, with or without paralysis, is almost as sudden as a stroke of apoplexy.

The features of the chronic form—symptoms with which an individual must always be regarded as living on the brink of disaster—are headache, dimness of vision, twitchings, thick heavy speech, attacks of asthmatic breathlessness, sleeplessness, and a varying amount of nausea, vomiting, and diarrhœa.

In cases of doubt the diagnosis is usually made by examination of the urine, finding a greatly diminished quantity of urea and usually a large amount of albumin. Where there is suppression of urine, the cause is, of course, fairly obvious.

The outlook in severe or acute attacks is exceedingly serious, and death almost always occurs. If the symptoms are merely those of the chronic type, a fatal result is seldom to be feared directly, although the condition may eventually lead up to it.

Treatment.—In acute attacks the main endeavour is to get the skin and bowels to act freely, so as to excrete as far as possible the waste products which are retained through abeyance of the functions of the kidneys. The bowels may be started to act by a hot-water enema or injection of a dessert-spoonful of glycerine, followed up by a dose of some powerful and quickly-acting purgative. For this purpose a $\frac{1}{4}$-grain pill of elaterium, or a couple of drops of croton oil mixed with a little olive oil, should be placed well back on the tongue. In this position they will be swallowed reflexly, even though the patient be unconscious. To act on the skin the patient, if not too ill, may be put in a hot bath. Otherwise a hot-air bath, or a hot pack for about twenty minutes to half an hour, may be used. To apply a hot pack a mackintosh sheet should be spread on the bed, a blanket wrung almost dry out of very hot water is laid on it, and, before it has time to cool, the patient, stripped, is completely wrapped up therein, so that every part except the head and face is covered. A second dry blanket should then be wrapped round, and the patient lies perfectly quiet in this mummy-like position. One to two teaspoonfuls of the tincture of jaborandi, or its active principle pilocarpine (given hypodermically), may be administered to encourage sweating, although there is some risk with these drugs of causing water-logging of the lungs. In a full-blooded person bleeding to the extent of one-half to one pint of blood may often be performed with advantage. If convulsions set in, chloroform should be inhaled in sufficient amount to control the fits.

If the patient recovers from the acute attack, the subsequent treatment—and that for any case in which there are chronic symptoms—must be pretty much the same as for chronic Bright's disease in general, particularly as regards dietary. (See BRIGHT'S DISEASE.) Saline purgatives (Carlsbad salts, sulphate of soda, &c.) and hot baths should be taken regularly. Nitro-glycerine in doses of one-hundredth of a grain, which may be had put up in convenient tablet form, is often advantageous, this amount being taken thrice daily.

Urethra, Affections of the.—The chief diseases affecting this tube, which conveys the urine from the bladder to the exterior, are inflammation (most commonly the result of gonorrhœa) and stricture. (See under PENIS, DISEASES OF THE, and *Gonorrhœa,* under VENEREAL DISEASES.)

Uric Acid Diathesis, or Lithæmia.—Uric acid is credited by many laymen and by not a few doctors as the fount and origin of the majority of the ills to which human flesh is heir, but, while there is no doubt a number of troubles in which urates and uric acid may be present in excess in the urine, it is by no means certain that the troubles are really due to them. A great deal of the talk about uric acid is simply humbug and a cloak for ignorance, and will continue to be so until our knowledge of the metabolism and chemistry of the body, and more especially of the nitrogenous elements, becomes more accurate. The appearances of uric acid and urates in the urine are described towards the end of the article on BLADDER, DISEASES OF THE. The chief symptoms due to, or, at all events, associated with, uric acid excess are gout, both in its regular and irregular forms, and the formation of gravel or stones. A common regimen for this trouble is large quantities of lithia and copious draughts of water. The water is certainly advantageous, and is the chief factor in most, if not all, spa cures. The lithia is probably only valuable in moderate amounts; beyond these it is depressant to the general system. Most of the sufferers from uric acid are persons who eat heartily, drink more alcohol than is good for them (although never to excess—oh dear no!), and take too little exercise. A proper spa cure will, of course, attend to all these factors, in addition to washing out the system with liberal draughts of its unsurpassed mineral water. The diet suitable for the uric acid diathesis is one approximating as closely as possible to a "purin"-free diet—*i.e.* one which contains no substances which can give rise to uric acid. This dietary, if strictly followed, will hardly go beyond the following articles: nuts, dates, raisins, macaroni, cheese, cream, butter, fat, eggs, apples, grapes, figs, honey, white bread, milk, and potatoes. (See also BLADDER, *Stone in the,* and GOUT.)

Urine, Abnormal Appearances of the, and Disorders in the Passage of.—These, although by no means necessarily or even most commonly due to actual disease of the bladder, are described at the end of that article. Difficulty in the passage of urine from the presence of a stricture is discussed under PENIS, DISEASES OF THE.

Urticaria.—See NETTLE-RASH.

Uterus or Womb, Diseases of the.—See under WOMEN, DISEASES PECULIAR TO.

Uvula, Affections of the.—In conditions of relaxed throat the uvula not infrequently becomes elongated, and, reaching the tongue, causes a constant irritative cough and tendency to retching. This condition will generally be completely recovered from under the remedies suitable for a relaxed throat (*q.v.*), but the uvula sometimes remains permanently elongated, and may have to be cut.

Vagina, Affections of the.—See under WOMEN, DISEASES PECULIAR TO.

Valvular Disease of the Heart.—See under HEART DISEASES.

Varicella is another name for chicken-pox.

Varicocele.—See under SCROTUM AND TESTICLES, DISEASES OF THE.

Varicose Ulcer.—See under ULCER.

Varicose Veins.—See under VEINS, DISEASES OF THE.

Variola is another name for smallpox.

Varioloid.—The name given to a modified, mild form of smallpox, such as occurs in persons who have had a previous attack, or who have been vaccinated, but in whom the protective effects of the vaccination have partly worn off.

Veins, Diseases of the.—The veins, like the arteries, do not suffer from many diseases. The blood in the veins is not under the same pressure from the pumping action of the heart and resistance of the walls as in the arteries, and in consequence the veins but rarely undergo the same degenerative changes in their walls which arteries are so liable to suffer from. The blood flows back to the heart through the veins under very low pressure, and there are valves in the veins, particularly the superficial veins, to prevent backflow of blood in them. In certain positions, more especially in parts at the far end of long veins, where the influence of gravity comes appreciably into play in the long column of blood, or where there is some obstruction to the flow of blood towards the heart, the veins are liable to become *varicose*—*i.e.* permanently lengthened, dilated, and tortuous. The superficial veins of the leg are those most commonly affected, and are those which are meant when a person is spoken of simply as having varicose veins. Other situations in which they occur are in the spermatic veins coming from the testicle, constituting what is known as a varicocele (see under SCROTUM AND TESTICLES, DISEASES OF THE), and at the lower end of the bowel, where they are called piles. (See PILES.) Occasionally, where there is obstruction to the flow of the venous blood from the abdominal organs through the liver, the veins of the stomach wall become varicose, and may be the source of alarming and even fatal hæmorrhage. We shall here only deal with varicose veins in the leg.

These are always most obvious when the patient is standing erect, and may, indeed, be quite unnoticeable when he lies down. They are caused by any condition which leads to frequent distension of the veins, such as prolonged standing, the pressure of tight garters (especially if worn below the knee), and occasionally to pressure on the veins higher up within the abdomen, such as from abdominal or pelvic tumours, or from the enlarged womb of pregnancy. Chronic constipation may also be a factor in their causation, and sometimes they are due to obstruction of the deeper veins in the lower limb causing excessive flow of blood in the superficial veins. Walking is not like standing in its tendency to cause varicosity of the veins, because the constant muscular contraction in walking has a pumping action on the veins which keeps them emptying. Once the veins have begun to dilate, the valves are too small to stretch across the widened channel, and are useless, and the condition tends to become steadily worse and worse, and spread to other branches than that in which it originally started.

The bluish tortuous veins can easily be seen under the skin, and they often feel thick and firm. Sometimes there are distinct pouches every here and there on the course of the dilated veins. The condition may extend right from the foot to the groin, but usually commences and is worst below the knee. If the condition is at all well-marked, the limb is rendered heavy, stiff, and painful, and there may be some dropsical swelling about the ankles, so that the skin pits on pressure. This soon disappears when the patient lies down. In cases of long standing there is great liability for eczema to occur over the veins, going on not infrequently to the formation of a varicose ulcer. (See under ULCERS.) Any scratch or injury over a varicose vein is also liable, instead of healing properly, to lead to the formation of an ulcer. Attacks of inflammation (*phlebitis*—see below) are also apt to occur readily within varicose veins, more especially in persons with any gouty tendencies. These are not only painful but dangerous, from the risk of a piece of the clot which always forms becoming detached and going to the heart and lungs and causing sudden death. Another risk associated with varicose veins is that one of the dilated pouches may give way, or an ulcer extend through the wall into a vein, and alarming hæmorrhage occur.

Treatment may be palliative—*i.e.* of a nature such as to prevent them from becoming worse, and to prevent complications—or radical and curative. Palliative treatment may be used in slight cases where there is little discomfort, where there is any constitutional disease precluding operation, or in the few cases where the condition comes on after blocking of the deeper veins. The patient should be warned against tight garters (and any garter to be efficient must be tight), must not stand much, and should rest frequently with the feet up. The bowels must not be allowed to be constipated, and the possibility of a tumour within the pelvis should not be forgotten. A crêpe bandage is the cheapest and most satisfactory form of support to wear. It washes, and it retains its elasticity for a long time, and is more comfortable than one of elastic webbing. Stockings are seldom so satisfactory, and they do not keep their elasticity so long. It is important that the bandage is well applied (a lesson or two in this should be taken to begin with), from the foot upwards, but it is rarely necessary for it to go above the knee. It should be put on before the patient rises in the morning, and not taken off until he is again in bed.

Eczema and varicose ulcers may be treated with Unna's zinc-gelatine paste (see under ULCERS), but frequently they will not heal properly until the veins are removed. Hæmorrhage, which comes from both above and below in the case of varicose veins, may be serious and even fatal if not rapidly checked, which it can be by firm pressure over the bleeding-point, and also above and below.

Radical operative treatment is to be recommended in most cases if the varicose veins are extensive or the discomfort severe, and particularly in young patients. It is more especially indicated when thin dilated pouches have formed, owing to the risk of hæmorrhage, when ulcers refuse to heal, or if there have been recurrent attacks of phlebitis. The operation of removal has been much simplified within recent years, and long stretches of vein can now be removed through quite small incisions. The cure is usually perfect, without any tendency to recurrence.

Phlebitis, or Inflammation of a Vein.—When inflammation occurs within a vein, the symptoms are obvious enough if it be a superficial one which is affected. The vessel becomes swollen and hard like a piece of cord, and painful. The skin over it and around is hot and congested, and there may be some swelling of the part on the side away from the heart. The general temperature may be slightly raised. When a deep vein is involved, it may not be possible to feel it, but the deep-seated pain and swelling of the limb are sufficient evidence of what has occurred. The swelling is due to thrombosis, or the formation of a clot within the vein, partially or completely blocking it. This always occurs, and constitutes the main risk in phlebitis, as a portion of clot may become detached and stick in the heart or lungs. Phlebitis rarely occurs in persons or in veins which are previously perfectly healthy. It is pretty common in varicose veins, and if the blocking of them which results is complete, may bring about a natural cure—a condition which, however, but seldom occurs, and a cure which is attended with considerable risk. Phlebitis in hæmorrhoids constitutes what is commonly spoken of as "an attack of piles." It may occur after a bruise or wound of a vein. It is peculiarly liable to occur in persons who are rheumatic or gouty, and it may come on after attacks of acute illness, such as pneumonia or typhoid fever. Sometimes the inflammation is of a very acute character, the vein becoming filled with what is practically a clot of bacteria, but in such a case there are always symptoms of general blood-poisoning which overshadow those of the local inflammation. Phlebitis may occur in almost any vein, but it is probably commonest in the veins of the lower limbs. The condition of "white leg," seen sometimes after delivery, is one of phlebitis of the veins in the leg, with, in addition, probably blockage of the lymphatic channels.

Treatment.—Owing to the risk of a portion of clot becoming detached, it is of the utmost importance that the patient should keep absolutely quiet in bed for several weeks, with the affected limb motionless (kept so by the aid of splints usually), and elevated so as to aid the venous return. For the relief of pain, lead and opium lotions or glycerine of belladonna may be applied spread on lint, or simple hot fomentation may be applied well covered over by a thick layer of cotton-wool. In applying the lotions, &c., care must be taken to handle the limb very gently and move it as little as possible. The diet should be light during the acute stage of the attack. When all signs of inflammation have gone, and time has elapsed for the clot to have been firmly attached—*i.e.* six or eight weeks—massage may be begun to assist in the removal of the swelling and stiffness, care being taken to see that the rubbing is very light to begin with. An elastic bandage will also help in restoring the circulation.

Venereal Diseases.—Three forms of venereal disease—*i.e.* disease spread (mainly, although not entirely) through sexual connection—require to be specially described, viz. gonorrhœa, soft chancre, and syphilis.

1. *Gonorrhœa.*—The chief symptom of an ordinary attack of gonorrhœa or clap in the male is the appearance of a thick discharge from the

urethra, or orifice at the point of the penis. The characters of the disease in the female are discussed separately under WOMEN, DISEASES PECULIAR TO. Gonorrhœa is an infective disease caused by a special germ, the *gonococcus*, and the infection is, in the great majority of instances, acquired through connection with a person who either has or has had gonorrhœa. The germ is one which it is very difficult to get entirely rid of once infection has been acquired, especially in the female, and the discharge which it causes is readily infective to any one else, long after, it may be, the acute symptoms of the attack have worn off. On the other hand, the germ is one which very quickly dies outside the human body, and the discharges, therefore, soon cease to be infective. Gonorrhœa may occasionally be acquired from the seats of public water-closets by women, or be spread from one girl to another sleeping in the same bed; but in the case of men the disease, practically speaking, can only be caught in one way—namely, through connection with a woman suffering from gonorrhœa. The symptoms commence within a few days of the infection, generally about the third or fourth day, sometimes sooner, with itching at the orifice of the penis and a scalding pain on passing water. The lips of the orifice become red and swollen, a thin, sticky discharge appears, but this soon becomes thick, abundant, and yellowish in colour. This stage usually lasts about ten days, and is often associated with a considerable degree of dragging pain in the back and loins, some feverishness, and a general out-of-sorts feeling. A first attack is always more severe than any subsequent one, although it is, at the same time, more easily cured. If suitable treatment is adopted, the discharge usually ceases in about two or three weeks; but if neglected, or sometimes in spite of treatment, the case may become one of chronic discharge or *gleet*. This means the presence or a more or less abundant discharge for months or even years, without any other troublesome symptoms than perhaps occasionally some scalding on passing water. Any discharge there may be is usually most noticeable in the morning, when the orifice will be seen to be closed by a little gluey-looking material, or some discharge may be squeezed out of the pipe. Although apparently so harmless, an individual with this condition can readily pass on gonorrhœa during connection, a fact which accounts for an immense amount of suffering amongst innocent women, they being infected by their husbands having an uncured gleety discharge, the result of an attack of gonorrhœa acquired perhaps years before.

Treatment.—Gonorrhœa is still regarded by many as a comparatively trifling complaint, and one not to be bothered about very much, but this is very far from being the case. It is of the utmost importance that every case should be treated thoroughly, on account of the various serious complications which may ensue, and also because of the great danger of communicating the disease to others. Unfortunately it is not always an easy matter to obtain a cure even by the most efficient treatment, but it is much less likely to be cured properly if only treated perfunctorily by the sufferer himself, and every case should be under a doctor's supervision. One of the best methods of treatment is by means of a large tube, into which the penis is placed and a partial vacuum produced in the tube, thus bringing about a condition of passive congestion, which eases the pain and gives excellent results; but the patient will require special instructions as to the method and length of time of application, &c., of this plan. In all cases, whatever method of treatment be adopted, the diet should be light and unstimulating, with complete abstinence from alcoholic drinks of any kind, from highly-seasoned dishes and condiments, and from shellfish, strong tea, and coffee. Large quantities of bland fluids, such as barley water or milk and soda, should be drunk. The scrotum should be supported in a suspender or pair of bathing drawers, and there should be no severe or prolonged exercise. The discharge should be received in some cotton-wool, which is kept surrounding the point of the penis constantly, being frequently changed and the soiled wool burned. Care must also be taken not to convey infection from the discharge by the hands, especially to the eyes. When the discharge begins to moderate somewhat, some of the balsamic remedies, such as copaiba, cubebs, sandalwood, &c., are generally given internally as an aid in treatment. They are all apt at times to cause digestive disturbance and to bring out rashes on the skin, and should not be persevered with if that is the case. There are various preparations of these drugs, one of the best being Nisbet's compound santal mixture, of which a tablespoonful may be taken twice or thrice daily. Injections locally constitute the other main line of attack, their object being to kill out the gonococci, but they are not employed if the vacuum tube method is being used. Silver salts are undoubtedly the best form of injection, and of these a 1 per cent. solution of protargol is amongst the most satisfactory. It should be used as follows. After emptying the bladder, the patient introduces the nozzle of a small glass syringe obtained for the purpose into the opening of the pipe, and injects a dessertspoonful or rather more of the solution—sufficient, at all events, to distend the urethral tube gently. The syringe is then withdrawn, and the injection retained for a gradually increasing time, commencing with two minutes and working up to a quarter of an hour. The injections should be made three times a day, and in most cases, except where there is very great pain and swelling, they may be commenced as soon as the discharge is noticed. The first day or two they make the discharge more profuse and cause considerable pain, but they soon tend to diminish the discharge and cause little discomfort. The treatment must continue until every vestige of discharge has disappeared, and it is sometimes a good plan to test oneself to see whether the cure is complete. This can easily be done by taking at night a couple of bottles of beer or a glass of whisky; if there is any vestige of the disease still about, this will cause some discharge to be visible in the morning. If, in spite of or from want of treatment, a chronic gleety discharge persists, the patient should certainly see a medical man, as further and more drastic measures will be necessary to get rid of it.

Complications of Gonorrhœa.—In patients with a long foreskin there is apt to be set up a general inflammation under it from retention of the discharge, but if the foreskin is regularly pulled back and any discharge washed off this should not occur. The glands in the groin may become enlarged and painful, and abscesses form in them. If there is any painful swelling, hot fomentations should be applied, and if the skin over them begins to get red, they will have to be opened and treated like any other abscess. Abscesses sometimes form on the under surface of the penis, their first indication being the formation of a tense, painful swelling. This requires early opening. An exceedingly painful complication is *chordee*, which means that the penis becomes stiff and erect but bent to one or other side. It is best treated by the application of cold-water compresses, and by the patient taking 20 grains or so of bromide of potash in half a tumblerful of water at bedtime. A spread of the inflammation to the testicle is fairly common, and is a serious complication, as it is apt to cause sterility. One or both testicles becomes swollen and tender. The treatment consists in supporting the scrotum in a Jullien's suspensory bandage, complete rest in bed, and free opening of the bowels by aperients. By *gonorrhœal rheumatism* is meant an inflammation of joints and structures around them due to a spread of the gonococci from the urethra to the affected joint or joints. Usually several joints are affected, the commonest ones to suffer being the knee, wrist, and ankle. Considerable swelling of a very painful nature occurs, and the condition is apt to be a very chronic one, not infrequently leading to disorganisation or stiffening of the joints. Treatment by means of vaccines (injections of killed cultures of artificially-grown gonococci) seems to give the best results in this condition. *Gonorrhœal ophthalmia*, or inflammation of the eyes, is one of the most serious complications which may occur. It may be met with in adults from careless transference of the discharge into the eye, but it is most commonly seen in new-born infants, the infection taking place during birth where the mother is suffering from gonorrhœa. A very large proportion of the blind have lost their sight in early infancy from this cause. In infants the condition can be prevented by carefully washing out their eyes as soon as possible after birth, and dropping into each eye a couple of drops of a 1 per cent. solution of nitrate of silver. This is now commonly done as a matter of routine in all children, but should certainly be done where there is any history of the mother having suffered from any discharge. If signs of redness and inflammation appear about a baby's eyes soon after birth, the sooner medical advice is obtained the better, as the disease runs a very rapid course. In adults the same advice applies, and there the treatment consists largely in the instillation of stronger solutions of nitrate of silver into the eye, with careful protection of the other eye by a shield to prevent its becoming infected too.

2. *Soft Chancre.*—This is probably the least common, and, at the same time, the least serious, of the venereal diseases, as the affection is purely local, and, as a rule, soon heals without any serious consequences. Its cause is so far undetermined, although it is almost certainly due to some germ. The infection is only spread by connection with some one suffering from the disease. About twenty-four hours after infection there appears somewhere about the point of the penis, or on one of the lips of the vulvar opening in the female, a red pimple. In two or three days this becomes a blister with a red, angry-looking zone round it, and about the fifth or sixth day it breaks down into an ulcer, with clean-cut edges and a sharp, distinct outline. It increases in size up to a certain limit, but, if kept clean, usually heals in about three weeks. Not infrequently more than one of these chancres or sores may be present, the secretion from the first being highly infective, and producing the subsequent ones through inoculation in some little scratch. Thus it may spread from the bulbous end or glans of the penis on to the foreskin, or from one lip of the opening to the other in females. The glands in the groin always become enlarged and tender, and a bubo or abscess sometimes forms in them. The treatment consists in keeping the sore clean by washing twice daily with boracic lotion, then dusting with a little iodoform (or, if the smell of this be objected to, aristol or europhen may be similarly employed), and wrapping up with some gauze or lint soaked in a little black mercuric lotion. If the glands in the groin are much swollen, the patient should rest in bed and have fomentations applied, but, if signs of abscess formation occur, the sooner they are opened the better.

3. *Syphilis* ("the great pox," "the bad disorder," "lues," &c. &c.).—This is a disease of the greatest importance on account of its being so widespread, from the multiplicity and seriousness of the symptoms which it produces, and from the fact that its effects may be felt in dire fashion years after the original attack, and that the disease may be transmitted even to the next generation. The primary sore—or *hard chancre*, as it is sometimes termed—usually appears on the genital organs (except where infection occurs in other ways than through sexual connection with a person suffering from syphilis—see below) from two to six weeks after infection. In the secondary stage, which follows in from six to eight weeks' time, the poison of the disease is distributed throughout the body, and rashes appear on the skin, along with sore throat, enlargement of glands, falling out of the hair, &c. In the third stage, which may come on within six months or may not show itself for many years, there are numerous symptoms, which may develop in connection with any of the organs of the body, including particularly the formation of tumour-like masses, which tend to break down into sores, and cause great cicatrisation when they heal; the arteries are apt to become very degenerated; and, finally, such diseases as locomotor ataxia and general paralysis of the insane are liable to develop.

Syphilis is now known to be due to the invasion of the body by a germ called the *Treponema* (or *Spirochœia*) *pallida*. Infection with this organism most commonly occurs during sexual intercourse, but there are various other ways in which syphilis may be acquired—*e.g.* kissing, sucking the nipple, examining syphilitic patients in the case of doctors and nurses, smoking a pipe, drinking from a glass, using a fork, &c., which has just previously been used by a person with syphilis. The primary sore, and the "mucous patches" which are present in the secondary stage with the sore throat, are intensely infective; the discharge from the sores of the tertiary stage is not so virulent by a long way, although it must still be regarded as dangerous. The discharges from the sores on infants with inherited syphilis are also infective. A child may acquire syphilis from either the father or the mother, and in the former case it is possible for a syphilitic child to be born of an unaffected mother. In such a case, however, the mother is, as a rule, rendered immune against syphilis, and will not be infected while suckling the child, although a wet-nurse would be so for a certainty. One attack of syphilis usually protects against any second infection, it being exceedingly rare for an individual to have a second attack, and, even when it occurs, it is of a mild nature.

Symptoms.—The primary sore is generally seen about the base of the foreskin or just inside the lips of the front passage in the female. It appears within six weeks of infection, but, as a rule, some hardening where the sore is to be will be noticeable about the third week. Long ere this time, however, the germ is spreading through the system, so that efforts at destruction of the primary sore are useless. The typical sore is a small, hard lump, feeling almost like a piece of gristle with a flattened top, but its appearance varies a good deal, depending on whether it is kept clean or is subject to any irritation, &c. Microscopic examination of a scraping from it by a doctor often reveals the presence of the causative organisms, and removes any doubt as to its nature. The glands in the groin soon become swollen and hard, feeling like pellets of shot under the skin. The primary hard sore or chancre usually heals within a couple of months, leaving a scar, but, even where treatment is commenced at once, the glands remain swollen and hard for a longer period. Sometimes, where there is doubt as to whether any sore is really syphilitic or not, treatment is not commenced until the secondary symptoms begin to show themselves, when there can rarely be any further doubt. If the proper treatment is commenced sooner, these may not appear; but this does not mean that the disease is cured right away, as will be pointed out later. The first of the secondary symptoms to appear is usually a faint rosy-red rash, seen especially on the abdomen, and generally accompanied by some feverishness and general malaise. Then the patient begins to suffer from sore throat, with the appearance of raised, moist, whitish mucous patches with sharply-defined edges—" snail tracks " —on the palate, tonsils, tongue, and lips. Warty-like growths often appear around the anus, or about the front passage in females. The hair often becomes thin, and tends to fall out, and there is commonly pain in one or in both eyes, with redness round the pupil from the presence of iritis. Lastly, skin eruption other than the early rose rash are exceedingly common. These assume a number of different characters, and often present considerable variations on different parts of the same patient, but, as a rule, they are of a coppery hue, affect both sides of the body symmetrically, and are seen best on the insides of the thighs, the fronts of the arms and legs, and on the forehead. Tertiary symptoms should never be allowed to develop, but if a case is not treated, or treated for too short a period or otherwise insufficiently, they may show themselves within six months of acquiring the disease, or not until many years (even twenty or more) later. They are more deep-seated and more dangerous to life and health from the destruction of tissue which they cause, although, at the same time, less dangerous (infectious) to others from their deep-seatedness. The chief tertiary manifestation is the development of a hard, painless swelling known as a gumma. These gummata may develop in practically any part of the body, and there are frequently a number of them at one time. They may be visible in or under the skin, or they may be deep-seated and only give rise to symptoms resembling those of a tumour in the situation where they are. After a time they tend to break down into sores, which heal slowly with extensive cicatrisation and resulting deformity. A patient with tertiary symptoms may therefore be expected to show various deep sores and rashes, or eruptions, on the skin; lumps on bones, such as the shin-bone, collar-bone, or breastbone; nodules or ulcers on the tongue; difficulty in breathing, with ulceration in the throat; swellings in the testicles; paralysis, &c., from gummata in the brain. In women, if pregnancy occurs, abortion is almost certain to take place. A common history in cases of women with syphilis is to have repeated abortions, each child being carried rather longer than the preceding; then a child is born at full-time, but dead; finally a live child may be born, but it soon develops the signs of hereditary syphilis. In other cases, however, a living child may be born right away.

Symptoms of Hereditary Syphilis.—The child may appear healthy at birth, although it is often puny and ill-developed, but definite symptoms may be expected before the child is three months old. It becomes thin and emaciated, the skin turns of an earthy colour and hangs in wrinkles, whilst the features look pinched and wizened like those of an old man. Snuffles is always present, and may be so marked as to make breathing very difficult when the child is at the breast; there is a discharge from the nose, and ultimately the bones and cartilages of the nose break down, giving rise to the flattening at the root of the nose and absence of all bridge so characteristic of congenital syphilis. Skin eruptions are sure to develop, and fissures form at the corners of the mouth, sometimes also round the anus. The milk teeth usually appear early, but are discoloured and soon crumble away. The permanent teeth may be healthy, but are frequently deformed, whilst the two central upper teeth show a very typical appearance, being peg-shaped—*i.e.* broader at the root than at the crown, and with the cutting-edge notched or crescent-shaped. The cornea or clear portion of the eye often becomes opaque, like ground glass, and, though it may clear up later, leaves some opacity, which interferes more or less with vision.

What about the outlook and prospects of a cure when syphilis has been acquired? Well, generally speaking, a cure can be obtained if the patient comes under treatment early, before the tertiary symptoms have begun to show themselves. It is only very occasionally that the attack is of such a virulent nature, or that the patient has some idiosyncrasy which prevents the proper drugs being administered, and in these cases a cure may not be obtainable. In untreated or imperfectly treated cases the tertiary manifestations are very apt to cause permanent damage, and may even be fatal, while there is always the risk of a later development of locomotor ataxia, general paralysis, or other diseases of the nervous system. It cannot be too strongly impressed, however, that the disease is not cured after a few weeks' or months' treatment, when all the symptoms have apparently disappeared. This is the commonest mistake that is made. Patients get tired of treatment, and think that, because the symptoms have all gone, the disease is cured, only to find out their mistake later on in life by the development of some more serious and permanent mischief, and perhaps by the handing down of a heavy load of misery to their children. The old rule that from two to three years' treatment is necessary, and that the disease cannot be considered cured until two years after the last appearance of any symptoms, may possibly be somewhat modified now with the latest method of treatment; but it should still hold good as far as marriage is concerned—namely, that no person who has had syphilis should marry until his doctor gives him a clean bill of health from all syphilitic symptoms over a period of two years. To do otherwise is morally inexcusable. There is also a modern method of examination of the blood by the "Wassermann test," which is of considerable value in ascertaining whether the virus is all out of the system or not, and it would be wise for any one wishing to know whether he is fully cured or not to have this test made by some one who is expert at it. It is, unfortunately, not of such a nature that it can be carried out by any doctor, but requires special laboratory methods and experience.

Treatment.—Considering the importance of syphilis both from a personal and a social point of view, it is essential that the treatment should be under the supervision of a medical man, and we need not, therefore, do more than merely indicate the lines upon which it is carried out. The primary sore requires little beyond ordinary cleanliness; as mentioned before, it is hopeless to attempt to eradicate the disease by its destruction. Where a cut or abrasion in a healthy person is unwittingly brought in contact with a syphilitic surface, the germs may be destroyed if the part is cauterised by a hot iron or by fuming nitric acid within a few minutes, but scarcely by anything weaker or after an hour or so. The ordinary hard sore should therefore be washed in warm water regularly, and then dusted with some powder, such as iodoform (or with aristol, orthoform, or europhen, which have the advantage of being odourless), and covered with a piece of lint. If the sore is allowed to become dirty and has a foul discharge, black mercuric lotion should be used to dress it with, a piece of lint soaked in this being kept in constant contact with the sore.

For the secondary manifestations mercury is the great remedy. Before its administration is commenced it is very important to have the teeth put in thoroughly good order, and they should be cleaned with some antiseptic tooth-powder (such as carbolic) after each meal, and the mouth should be washed out several times a day with some astringent mouth-wash, such as 20 per cent. listerine in water. Naturally the dentist whose services are requisitioned to attend to the teeth should be informed as to the patient's complaint. The diet should be simple, and alcohol should be taken, if at all, in very, very limited quantities. Smoking should also be in moderation, and must be given up altogether if there are any patches inside the mouth. Mercury may be given in a variety of ways—by the mouth in the form of pills, powders, or solutions; by inunction, rubbing in of mercurial ointment; by fumigation, the patient sitting in a sort of cabinet, inside of which mercury is being volatilised; or by intra-muscular injections. By whatever method it is given, treatment must be kept up intermittently over several years. As some sort of indication we may mention that one of the greatest authorities recommends ten months' treatment, spread in intervals over the first two years, and, in the succeeding two or three years, two or three courses of mercurial administration lasting six weeks each. For the tertiary manifestations of all sorts, iodide of potash, sometimes along with a little mercury, is the great remedy, some ten grains thrice daily in solution in water being usually given to begin with, increasing until twice or thrice that amount is being taken. Other drugs are often employed, in addition, for various special symptoms which may arise—*e.g.* sarsaparilla, iron, and arsenic. Mention of arsenic brings one to the most modern treatment of syphilis—namely, by salvarsan, or "606," as it is popularly called, having been the 606th arsenical compound which its discoverers had experimented with in the treatment of syphilis. This is given by injection into the veins, and it was claimed for it at first that a single dose would at once and permanently cure syphilis by destroying all the germs in the body. This has since been demonstrated not to be by any means always the case, but nevertheless this drug has undoubtedly an enormous power in destroying the germs of syphilis, and is a great aid in the cure of the disease, although considerably more than one dose of it may be necessary. In inherited syphilis the treatment should commence as soon as the disease is definitely recognised. Mercury is best administered by anointing the child's binder with mercurial ointment, or by rubbing it into the soles of the feet every night. This generally has to be continued until the child is about a year old, with subsequent shorter periods of administration, along with iodide of potash. Salvarsan may also be employed in the case of infants. If the mother is unable to nurse the child, it must be brought up by hand; on no account must it be given to a wet nurse, or she is certain to acquire the disease. There is considerable difference of opinion as to whether hereditary syphilitics should marry; they may apparently hand on the disease to the third generation, but, on the other hand, they may and do have perfectly healthy children.

Verruga, or Peruvian Wart.—A peculiar disease confined to the western slopes of the Andes in Peru and neighbouring countries, and occurring in certain narrow river valleys. The cause of the disease is unknown, but it is apparently not contagious. The symptoms consist in irregular attacks of fever, with pains in joints, and, later, the development of wart-like structures on the skin, and also the formation of swellings of the same nature in various organs throughout the body. The symptoms are often very severe or even fatal; in favourable cases the eruption begins to clear away after about six months or so. No specific treatment is known, but apparently arsenic by hypodermic injection gives the best results.

Vertebræ, Diseases of the.—See SPINE, DISEASES OF THE.

Vertigo.—Giddiness, dizziness, or vertigo is a subjective sensation of loss of equilibrium, the patient feeling as if he were losing his balance or as if surrounding objects were revolving about him. In its slighter degrees it is merely a swimming lightness in the head. The gait in an attack of vertigo may be staggering like that of a drunken man; there is frequently associated nausea, or even actual vomiting; loss of consciousness, if occurring, is only momentary. The condition is rather an alarming one to a patient, and, since it may be an indication of serious disease, it is always well to be thoroughly examined, but in many instances the causes are temporary and remediable. The commonest cause is probably simply being run-down or neurasthenic, in which state attacks of vertigo are frequent, although generally of brief duration and mild in character. Gastric disturbances—indigestion of all kinds—are another common cause of vertigo. In elderly people it is a common symptom of thickening of the arteries, especially those of the brain. (See ARTERIES, DISEASES OF THE.) Sudden attacks of vertigo, along with ringing in the ears or partial deafness, constitute the condition known as Menière's disease. (See *Ringing in the Ears*, under EARS, DISEASES OF THE.) Eye-strain from some error of refraction, &c., is another common cause of vertigo; in this instance it will be associated with some indistinctness of vision, headache over the eyes or at the back of the head, and a tired feeling in the eyes, especially after engaging in close work. Examination by an oculist and some form of treatment by spectacles, &c., is indicated. Less common causes of vertigo are over-indulgence in tea or tobacco, brain tumours, epilepsy, also mechanical causes, such as sea-sickness or train-sickness.

The appropriate treatment will naturally depend upon the cause of the vertigo being satisfactorily discovered. While the attack is on the individual should lie down, in a quiet, darkened room if possible. A dose of some purgative medicine or an emetic to induce vomiting is often helpful in cases where the attack is lasting some time; and, if the condition is very distressing, a soothing draught, such as 30 to 40 grains of bromide of potash in half a tumblerful of soda-water, may be administered.

Vetch Poisoning, or Lathyrism.—When under famine conditions, bread, &c., made from the seeds of various species of vetch is occasionally eaten, and after some time may give rise to certain symptoms of disease. The disease is known in India, Algiers, France, and Italy. The earliest symptoms are pain in the back and weakness in the legs. This weakness increases until there may be almost complete paralysis of the lower limbs, with marked wasting. The upper limbs are, as a rule, unaffected, but there may be some trembling in the hands. There is commonly incontinence of urine. The mind is not affected. The disease is not usually a fatal one, but when the symptoms have definitely appeared there is little hope of much recovery. No treatment is known to have much effect, but naturally the most important thing is to stop the use of vetch meal and warn others of the risks they run in eating it.

Vision, Disorders of.—See EYES, DISEASES OF THE.

Voice, Affections of the.—See SPEECH, DISORDERS OF, and THROAT, AFFECTIONS OF THE.

Volvulus means an obstruction of the bowel by its twisting or forming a loop upon itself. (See *Obstruction of the Bowels*, under INTESTINES, DISEASES OF THE.)

Vomiting.—This means the expulsion of the contents of the stomach by the mouth. The term "retching" is used where the effort of vomiting is made but nothing comes up, while sickness or nausea means the presence of an inclination or desire to vomit, or a feeling as if vomiting were about to occur. These conditions may be conveniently considered together. The act of vomiting is brought about by a concerted closure of the glottis or opening into the windpipe, opening of the cardiac or upper orifice of the stomach (where the gullet opens into it), and contraction of the wall of the stomach, diaphragm, and abdominal muscles. This combined squeezing action forces the contents violently up the gullet and out at the mouth. The co-ordination of all these factors concerned in the act of vomiting is secured in what is believed to be a special "vomiting centre" in the medulla oblongata of the brain. The impulse to vomit usually comes from the stomach itself, but it may reach the vomiting centre from various other sources, which leads us to the causes of vomiting.

Affections of the stomach are naturally those responsible for most cases of vomiting, especially acute gastric catarrh. Chronic gastric catarrh, especially when due to long abuse of alcohol, is often responsible for morning sickness, vomiting, or retching, although in women the possibility of pregnancy as a cause of morning sickness must not be forgotten. In dilatation of the stomach the vomit is often very large in amount and fermenting. In gastric ulcer there is associated severe pain, usually relieved by the vomiting. Poisons may, of course, be responsible for vomiting, and in such a case the vomiting is to be encouraged rather than otherwise. Attacks of pain in the stomach and persistent vomiting sometimes occur in locomotor ataxia.

The vomiting may be set up by poisons circulating in the blood, and this group includes those cases of vomiting occurring at the onset of some acute fever, such as scarlatina, measles, pneumonia, yellow fever, &c. &c. It is also common in advanced stages of Bright's disease, often heralding the onset of uræmia.

Gross brain disease is also not infrequently associated with vomiting; in such cases it is usually unaccompanied by any nausea or feeling of sickness, and bears no particular relation to the time of taking food. Thus it may be present from cerebral tumour or abscess, in cerebral hæmorrhage, and in meningitis, especially in children.

Anæmia of the brain from loss of blood, shock, &c., may also set up vomiting, as may strong emotions, such as disgusting sights or odours. Some very obstinate cases of vomiting are purely hysterical, but such a diagnosis should never be come to without very careful examination and exclusion of all other possible causes. Migraine or sick headache usually ends in vomiting.

Astigmatism and eye-strain may set up vomiting. The stimulus to vomit may come from the throat, as in any case where there is severe coughing (*e.g.* whooping-cough) or from an elongated uvula, whilst tickling of the back of the throat is a familiar method of bringing about vomiting.

Various troubles connected with the bowels are accompanied by vomiting, such as appendicitis, peritonitis, and obstruction from any cause. In such cases the vomiting, if allowed to go on, brings up the bowel contents, so that the vomit smells like the motions. This is always an indication of something seriously wrong, and we would advise any one having to do with a patient who is vomiting, and who has severe abdominal pain, to lose no time in getting a doctor.

Vomiting may come from diseases of the liver, especially those which set up jaundice; from kidney affections, such as the passage of a renal calculus or stone, as well as from uræmia, as mentioned above; and from conditions affecting the internal organs of generation in women, such as displacements of the womb, acute inflammations, early pregnancy, &c.

It will be seen, therefore, that vomiting *per se* is of little value in diagnosis, if other circumstances are not taken into account. Whilst in many instances some irritant or unsuitable article of diet is responsible, this explanation must not be accepted too lightly, especially if there be abdominal pain and rigidity. Many cases of acute abdominal disease are allowed to go on so long that it is almost too late to do anything, because the vomiting and pain are set down to gastric catarrh and colic. The possibility of many other causes for the vomiting will be apparent, and it is only by taking the whole of the symptoms into account, and not the one isolated condition, vomiting, that a certain diagnosis can be come to.

Treatment.—It is often necessary to treat vomiting, either pending more special treatment for its cause or where the cause is not removable. In the case of sickness due to some indigestible food or the like, it should, of course, be rather encouraged until the stomach is completely emptied, and then the treatment is that for acute gastric catarrh. (See under STOMACH, DISEASES OF THE.) The application of a mustard-leaf below the lower end of the breastbone is often successful in stopping the vomiting, but not always. Where it fails, a leaf may be applied to the left side of the neck; it is here over the vagus nerve going to the stomach, and the stimulation of this not infrequently makes the vomiting stop. Of drugs the handiest is lime-water, of which a tablespoonful should be given every hour for several hours. Iced champagne in teaspoonful doses every quarter of an hour is another popular, and also, it must be conceded, very efficacious, remedy. In the morning vomiting of chronic gastric catarrh a couple of drops of Fowler's solution of arsenic is often helpful. For treatment of excessive morning sickness in pregnancy see under PREGNANCY, COMPLICATIONS OF. Perhaps the most generally useful drug for vomiting is bismuth, of which 20 grains of the subnitrate may be taken in a cachet which has been well moistened before the attempt is made to swallow it. Drugs such as opium, chloral, &c., are sometimes necessary to soothe the excitability of the vomiting centre in the brain, but they should not be employed except under medical control. Where bowel contents are being vomited, relief from the awful nausea will be afforded by having the stomach washed out. Vomiting in infancy, if more than quite a temporary thing from overfilling of the stomach, usually indicates that the dietary is in need of revision.

Vulva, Affections of the.—See under WOMEN, DISEASES PECULIAR TO.

Warts.—See under SKIN DISEASES.

Waterbrash is the term applied to a condition where, during the process of digestion, the mouth fills with fluid, which may be either sour or tasteless. It is frequently associated with heartburn, and is a symptom of over-acidity of the stomach, or of dilated stomach and regurgitation of fluid. (See under DYSPEPSIA, and STOMACH, DISEASES OF THE.)

Water on the Brain.—This is the popular term for hydrocephalus, although it is sometimes used also to designate the more chronic forms of meningitis, in which some hydrocephalus often develops. (See under these headings.)

Water, Troubles connected with the making of.—See at the end of the article on BLADDER, DISEASES OF THE; also under PENIS, DISEASES OF THE; and under WOMEN, DISEASES PECULIAR TO.

Wax in the Ear.—See under DEAFNESS.

Waxy Disease.—This is a condition not often seen nowadays, and is in any case not so much a disease in itself, but a complication which is apt to occur in old-standing cases of syphilis, tuberculosis, or other conditions in which suppuration has been allowed to continue for a long time. It consists in a peculiar degeneration in various organs, giving rise to a firm, waxy appearance in them. The development of this state of affairs diminishes the patient's strength and lessens the chances of recovery, but modern treatment is usually successful in preventing things reaching such a stage as to lead to the occurrence of waxy degeneration.

Webbed Fingers or Toes.—See under DEFORMITIES.

Wens.—These are cysts formed by the blocking of the ducts of the sebaceous or fat-secreting glands of the skin. They may form on any part of the body, but are much commoner on the scalp than elsewhere. They form smooth, rounded, elastic swellings, freely movable with the skin on the underlying structures. They contain retained secretion in the form of thick, cheesy-like material. They may attain considerable size—that of a hen's egg, for instance—but are not in any way dangerous. Their unsightliness or awkward position—for wearing a hat, &c.—often calls for their removal. This can easily be done under a little cocaine, or even without an anæsthetic; but, after letting out the contents, it is necessary to have the dilated sack, in which the cheesy material is confined, dissected out and completely removed. If this is not done, there is considerable likelihood of it refilling. Sometimes wens become inflamed and suppurate, in which case they must be treated like any ordinary abscess.

Wetting the bed is the common designation of incontinence of urine in children. (See under BLADDER, DISEASES OF THE.)

Wheals are raised white areas of the skin with a red surrounding zone. If not due to blows, they are usually a symptom of nettle-rash or urticaria. (See NETTLE-RASH.)

Wheezing is the sound produced when there is any interference with the free entry of air into the bronchial tubes. (See under BRONCHITIS and ASTHMA.)

Whipworm.—A fairly common parasitic intestinal worm. (See under PARASITES.)

White-leg.—See under LABOUR, COMPLICATIONS OF, also under VEINS, DISEASES OF.

Whites, or Leucorrhœa.—See under WOMEN, DISEASES PECULIAR TO.

"White Plague" is a name sometimes used for tuberculosis, and **"white swelling"** a term used for the swellings, usually in joints, due to the formation of chronic tubercular abscesses. These are white instead of red, as in the case of an acute abscess, hence the name. (See TUBERCULOSIS, CONSUMPTION, and ABSCESS, *Chronic*.)

Whitlow.—The term whitlow may be applied to any form of acute inflammation or septic infection of the fingers. The deeper the infection is in the tissues of the finger, the more serious is the condition, because it is liable to get into the tendon sheaths and spread up into the palm of the hand, or even higher. The risk is always greater if the site of the whitlow be on the thumb or little finger, because their tendon sheaths run right up to the wrist into the sheath of the tendons there, whereas those of the three centre fingers end in the palm. A whitlow is started by dirt and germs getting into the tissues through a wound, crush, bruise, or scratch; by a splinter of wood, &c., running into the finger; or even by germs gaining entrance through a ragnail or invisible scratch about the base of the nail. The first symptom is a throbbing pain in the affected finger, made worse if the hand is allowed to hang down. The part then becomes red and swollen, and exquisitely tender to touch. The condition is one demanding urgent treatment, because, if allowed to continue or spread, it may end in almost complete destruction of the tendon or tendons, and consequent stiffness of the finger, or even of the whole hand.

Treatment.—The hand should be kept supported in a sling, and may even with advantage be kept up with a bandage or sling, so that it rests on the opposite shoulder. A poultice, or, better, a hot fomentation (boracic lint or flannel wrung out of hot water and completely and widely covered by a piece of oil-silk), may be applied to relieve the pain, and medical aid sent for, as these measures of themselves will not be sufficient to stop the progress of the infection. If seen in good time, the doctor may be able to obviate the necessity of opening the whitlow by the application of a rubber bandage higher up the arm, thus bringing about a condition of passive congestion; but, if pus has already formed, it will be necessary to make one or more openings. The position of these, and more particularly the depth to which they are made, demands considerable judgment, because, if the infection has not spread so deep as the tendon sheaths, opening into them will only increase the risk of the infection spreading into them. In cases where the infection has spread considerably, the hand after opening is often immersed continuously for some time in a bath of warm boracic lotion.

Whooping-cough.—This disease when fully developed is so characteristic, with its spasmodic attacks of coughing terminating in the typical "whoop," that it can scarcely fail to be recognised. This stage is, however, preceded by a period of ordinary bronchial catarrh, in which a definite diagnosis of whooping-cough is impossible.

It usually occurs in regular epidemics, and is essentially a disease of young children, comparatively few cases occurring after the age of five years, although no age is altogether exempt. It may attack infants, and in them is often a very severe complaint, and it is also a dangerous one in rickety or weakly children. The disease is caused by a definite bacillus, and the infection is spread about in the secretions from the nose and throat. It is most infectious during the early catarrhal stage—*i.e.* before the complaint is definitely recognised to be whooping-cough. After the whoop develops the infectivity becomes much less, although the sputum must still be regarded as capable of spreading the disease. Second attacks of whooping-cough are very rare.

The period of incubation between the exposure to infection and the first appearance of symptoms varies between eight and sixteen days. Then the symptoms of a catarrhal bronchitis come on, with a short, dry cough, some feverishness, and a general out-of-sorts feeling. There is usually also a little cold in the head, but this is not, as a rule, severe. This stage generally lasts about ten days, but, before the first actual whoop appears, suspicions as to the true nature of the complaint may be aroused (quite apart from the fact of an epidemic being known to be about) from the cough occurring in paroxysms of a series of short, sharp barks, worse at night, and often producing vomiting. Then a typical whoop occurs, and all doubt as to the diagnosis is at an end.

The paroxysms consist of a number of short explosive coughs in rapid succession, without any air entering the lungs, so that the patient often becomes black in the face; ultimately there is a long, violent inspiration, giving rise to the characteristic crowing sound or "whoop." A number of these paroxysms often follow close upon one another, and relief is not obtained until either a considerable quantity of sticky expectoration is brought up or vomiting occurs. These attacks may occur from half a dozen to a score of times in the course of the twenty-four hours, being liable to occur both day and night. Crying and taking of food are liable to bring them on. Children are often aware the attacks are coming on, and their efforts to stave off the cough are very pitiable to see. Although so dreadful to witness, it is exceedingly rare for actual suffocation to occur during an attack, as is often feared by the parents, but children are often very exhausted after severe paroxysms. Small ulcers often develop under the tongue from the force with which it is compressed against the lower teeth and gums. Unless complications ensue, there should be no fever during the whooping stage. The paroxysms usually continue for several weeks, and then gradually diminish in severity and frequency. Some patients get off with a few days' "whooping"; in others the whoops may recur for months, especially if any slight cold is contracted.

Whooping-cough is not a disease to be feared in a strong, healthy child, but in a weakly one, especially if under two years of age, it must always be regarded as serious. The complication most to be feared is severe bronchitis and broncho-pneumonia. This will be characterised by irregular fever, constant rapid breathing, and a rapid weak pulse. The face is pale or slightly dusky, and the sides of the nose may be seen to be working in and out with each respiration. So long as a child remains well and bright between the spasms of coughing, and does not show much wasting, the outlook is quite favourable.

Treatment.—During the first catarrhal bronchitis stage all cases are best kept in bed. Once the whoop has developed the patient is better to be up, always provided there are no complications, and strong children are undoubtedly better to be out of doors in dry, warm weather; but with weakly children or in cold weather they should be kept in the house, but in a freely-ventilated room, not in a hot, stuffy atmosphere. The chest should be rubbed night and morning with some stimulating liniment, such as camphorated oil, and protected with a light jacket of flannel or of gamgee tissue. While coughing the child should be supported by some one, and a suitable vessel should always be at hand for the coughed-up or vomited material. The diet should be light, but need seldom be restricted entirely to liquids. It is always a good plan to feed immediately after a bout of coughing, as there is then more chance of the food being digested and absorbed before the next attack of coughing and possible vomiting occurs. Drug treatment is very disappointing, some authorities going the length of saying that six weeks is the only medicine of any value. In strong children no medicine is really required, but, if the paroxysms are very severe, some sedative drug may have to be given. It must be left to the discretion of the doctor to order this, however, and it is commonly the case that several may have to be tried before one is found of service in any particular case. When broncho-pneumonia occurs, fresh air and cold sponging are essential, also free stimulation with alcohol and strychnine. (See under Lungs, Diseases of the.) It is usual to isolate cases for six weeks, but it is doubtful if it is really necessary after the whooping stage has developed, the infectivity being so slight, and it is certainly not always conducive to the patient's best interests.

Winter Cough.—See Bronchitis, *Chronic.*

Womb, Diseases of the.—See under Women, Diseases peculiar to.

Women, Diseases peculiar to.—The diseases peculiar to women—*i.e.* connected with their reproductive organs and functions—constitute a large proportion of the ailments from which women suffer. Some of these are simply of a nature which interfere with the patient's comfort, but do not necessarily impair the general health or endanger life; others, on the contrary, are of a much more serious nature.

One great difficulty in the consideration of the diseases of women is to decide how far the symptoms are actually due to local disorders, and how far to nervous weakness. The nervous system in women is undoubtedly much more sensitive than in men, and symptoms are often unconsciously exaggerated, either through fear or from having too much time in solitude to think about their painful sensations. Many women, on the other hand, will keep their symptoms to themselves far too long, from dislike to discuss such matters, or from other reasons. It is also the case that general symptoms of a nervous character are often attributed to conditions of the reproductive organs which are really of a comparatively trifling nature; the patient's nervous condition has either created or directed attention to the local disease. If the patient's general mental and bodily condition is attended to and put in a healthy condition, such local troubles can be safely left to look after themselves. In the treatment of women's diseases it is frequently of the greatest importance that the treatment should be carried out away from home. If this is not done, it is a practical impossibility to get the necessary rest for mind and body which are required, and which are often of really greater importance than the local treatment.

We propose, in dealing with women's diseases, to take up the subject as far as possible from the point of view of symptoms, rather than from that of the individual diseases from which the various organs suffer. This arrangement seems more practical, because a woman does not complain of an inflamed Fallopian tube or a displaced womb, but of pain, discharge, &c. This arrangement may lead to some repetition, but it will probably be more useful, and will be a better guide as to whether treatment can safely be conducted at home or whether skilled advice is more or less urgently required. For some complaints a good deal can be done by the patient herself, for others nothing short of operation is any good.

It will be convenient, in the first place, to say a few words about one or two general symptoms of frequent occurrence in women, and which are certainly often present in women with something the matter with their reproductive or pelvic organs, but which, nevertheless, are probably in most cases not directly due to the state of these organs, but rather to their general poor health.

First of these we may mention *headache.* This is a condition which, as is mentioned under that heading, may arise from a number of different causes, but is probably never directly due to pelvic disease. Migraine (sick headache or bilious headache) is the commonest form of periodically recurring headaches in women, and anything which lowers the nervous tone of a person subject to migraine is apt to bring on an attack; hence the frequency with which they occur at the menstrual periods. But they may occur quite independent of these times, and from other causes, such as worry, indigestion, &c. If there be any actual disease of the pelvic organs, the headaches may certainly be aggravated thereby. Such headaches often are very troublesome at the change of life, but, after it is past, cease to trouble any more. The other common causes of headache in women are anæmia, neurasthenia, and constipation. Headaches from these or from any other cause may be lessened in frequency or severity by attention to any pelvic disorder which may be present, but are not likely to be cured entirely simply by such treatment. (See HEADACHE.)

Pain in the back is another common complaint in women—so common, indeed, that women have been divided into "those with backs and those without them." Backache, of course, may be due to some disorder of the organs of generation, and is then usually felt low down in the back, over the sacral bone. This is dealt with subsequently under the heading *Chronic Pelvic Pain.* But there are many women who have aching backs more or less constantly, but are otherwise perfectly well and without any sign of disease. Such pain is felt in the small of the back; it is made worse by fatigue, and is relieved, but not always removed, by lying down. It is always worse before and during the menstrual period, and anything which lowers the general state of health aggravates it. This form of backache is, in all probability, caused by weakness of the muscles of the back, and this weakness in its turn is due partly to the lack of a sufficiency of free open-air exercise in growing girls, and partly to the wearing of stays, so that the weight of the skirts comes on the waist instead of from the shoulders. A great deal can certainly be done to prevent the development of weak backs by seeing that girls, until they are fully grown, have plenty of outdoor games and exercise, and that the wearing of stays is postponed as late as possible (better still, for ever). If the condition is once allowed to develop during the growing period, no subsequent treatment will entirely get rid of it, and stays as a support to the weak muscles become a necessity. Lying down, by resting the easily-tired muscles, relieves the pain, and so does rubbing the back, by improving the circulation locally.

Muscular overstrain, dyspepsia, constipation, movable kidney, and lumbago are other common causes of backache, and the possibility of its being due to spinal disease should not be forgotten, or proper treatment for such a case may be delayed until it is too late to do much for it. Sometimes the pain is very low down—namely over the coccyx (*i.e.* just above the anus, and quite confined to that spot)—a continuous aching pain, present, it may be, for months on end. Such a condition is really of the nature of a neuralgia, and generally without any local disease to account for it. The best treatment for such cases is usually a complete change of surroundings away from home, with general tonics and attention to the bowels to see that there is no constipation. Local sedatives, such as rubbing with "A B C" liniment, may be necessary for the relief of pain, but they are in no sense curative. (See BACKACHE.)

Hysteria was at one time thought to be due to some disease of the womb, but it is now recognised to be a state of instability of the nervous system, and not to be in any way dependent upon the generative organs. Hysteria and pelvic disease may of course co-exist, and occasionally hysteria leads to the symptoms of some pelvic disorder being simulated, in the desire for sympathy which is such a strong feature of hysterical patients. One of the commonest of these pelvic hysterical symptoms is retention of urine. The patient, generally a young unmarried woman, finds that she cannot pass water, and in such a case, although it is probably advisable to get a doctor to pass a catheter to draw off the urine once and so exclude the possibility of any real organic disease, this procedure should certainly not be repeated. The patient should simply be told firmly and clearly that such a procedure is unnecessary and harmful, and in most cases the condition will not be heard of again.

Neurasthenia.—Nervous weakness or nervous exhaustion, although arising in many ways, in women is certainly often due to the strain involved in child-bearing and its consequences—the strain of pregnancy, labour, and nursing, the worry and anxiety inseparable from the care of young children, &c. &c.—helped sometimes by actual disease of the pelvic organs. Physical or mental over-exertion, pain, unhappiness (which is mental pain), worry, or the shock of an operation, even a slight one, may all be responsible for the development of neurasthenia. Pelvic disorders which at other times might pass unheeded will, when a woman is badly run down, force themselves on her notice, and assume a seriousness to her which they really do not possess. It is important that any pelvic trouble in a neurasthenic patient should be put right, but it is infinitely more important and pressing that general treatment (on the lines of a rest-cure) should come first. (See NEURASTHENIA.)

We now come to the more particular and local symptoms associated with diseases of the female pelvic and reproductive organs, and firstly we shall consider *chronic pain* in the pelvis or lower portion of the abdomen, using chronic in the sense of pain that is of long duration or frequent recurrence, but without any acute feverish disturbance. It is necessary, in the first instance, to point out that pain in the lower part of the abdomen is not necessarily associated with an affection of the special pelvic organs; it may be due to some kidney affection, especially stone in the kidney and movable kidney. In these cases there will be distinct tenderness over the actual kidney region, and probably other more or less distinctive symptoms. (See KIDNEY DISEASES.) The pain may be in the bowel—*i.e.* of a colicky nature. This variety of pain is common in persons who allow themselves to become badly constipated, or where intestinal decomposition is going on, with distension of the bowel by gas. Pain of this nature is distinguished by shifting its position and not being confined to the pelvis, by not varying appreciably with change of position, and by being relieved rather than aggravated by firm pressure on the abdomen if affected at all by pressure. In some cases of affections, especially ulceration, of the sigmoid or portion of the large bowel just above the rectum, there is pain always felt before the bowels move. With these exceptions most chronic pains felt in the lower portion of the abdomen and pelvis are directly connected with affection of the pelvic or internal reproductive organs.

Chronic ovarian pain from congestion, inflammation, or prolapse of one or of both ovaries is characterised by a chronic aching feeling low down in the abdomen, usually on both sides, with sensitiveness to comparatively light touching of the skin and tenderness to deep pressure, usually most intense at points midway on either side between the navel and the prominent points of the haunch-bone in front. The pain is usually worst just before the menstrual period, easier after it has come on. Internal examination by a doctor in such cases reveals, as a rule, no gross sign of disease, except in the case of a prolapsed ovary, when it may be felt tender and out of place. Such cases of chronic ovarian pain are most commonly met with in women who have borne a number of children in quick succession, and in them there is usually also all the signs of general neurasthenia or nervous exhaustion. For this kind of patient the treatment appropriate to neurasthenia is the most important, especially rest in bed for some time, away from home with all its work and worries. Blisters applied to the abdominal wall over the ovaries every three or four day, or rubbing daily with compound capsicum liniment, do good. The use of hot douches is also to be recommended. To use these properly the patient should have a douche-can containing at least half a gallon, and the water should be at a temperature of not less than 112° F. By means of a long nozzle this is allowed to flow by the action of gravity—the douche can being elevated about 3 feet above the body—right to the highest part of the vagina, where it is in close apposition with the ovaries. It is better done with the patient lying at the edge of the bed on a rubber or macintosh sheet, than in a sitting or squatting posture, and should be carried out at least twice daily.

Chronic ovarian pain may also be due to over-indulgence in alcohol, or by sexual intercourse in excess of the patient's real desires. The treatment for such cases is obvious. Ovaries are occasionally removed for chronic ovarian pain, but this should not be done until other measures have been given a thorough trial, and very reluctantly in any woman unless she be nearing the change of life, when removal of the ovaries has no ill side-effects.

Chronic Pain from Affections of the Uterus or Womb.—These may be (1) displacements of the womb, or (2) chronic enlargement of the womb from failure on its part to return to the normal size after delivery, or, as it is technically termed, "sub-involution." This *sub-involution* is only likely to occur after a delivery when something goes wrong during the lying-in period, and is not likely to get entirely right until another pregnancy occurs with an uneventful after-confinement. Unfortunately this is not always easy to obtain, for in such patients there is often a state of sterility produced by the disease. The chief symptom is persistent pain in the lower part of the abdomen—not severe, but a constant ache, which is lessened but not removed by resting. It is worse usually for some days before the menstrual periods, and rather better for a little time after them. The periods are generally excessive, and there is commonly also a more or less constant white discharge. There is often, although not always, frequency of passing water, with some smarting during the act, and in many cases the patient also suffers from piles or fissure of the anus, with painful movement of the bowels. There is almost always pain during the act of sexual connection. Patients with this chronic pain are very apt to become neurasthenic and badly run down. In cases that have only lasted a few months, treatment may bring about a recovery; but, if the disease has been allowed to go on for some years, it is likely to persist until the climacteric, when the constant invalid may change into a robust, healthy woman, "laying aside," as has been said, "her sex's weakness with her sex's function." The best treatment, as has been mentioned, is pregnancy. In a case of not long standing, liquid extract of ergot—half a teaspoonful three times a day given for three months—may bring about proper involution of the womb. Hot douching night and morning, as advised above for ovarian pain, is of the greatest value; and, if the discharge is at all offensive, a tablespoonful of Condy's fluid or of Sanitas fluid may be added to each pint of the douche. If the patient is run down, rest is essential, and a course of spa treatment is often very beneficial, not so much on account of any wonderful quality in the waters or baths, but from the rest, change, and general healthy mode of life which is so easily adopted there and so difficult to get at home.

Displacements of the Womb.—The two important displacements of the womb are prolapse, or falling down of the womb, and backward displacement of the womb. These conditions are certainly much commoner in women who have borne children than in others, from stretching or tearing of the parts during childbirth; but they may also occur, and even in virgins, from weakness of the muscular floor of the pelvis through the overstrain of long hours of work, particularly if it involves much standing, and from insufficient nourishment. Sudden violent exertion may also bring about displacements quite suddenly.

Let us consider first prolapse, or falling down of the womb. In bad cases the condition is obvious, as the patient sees, or, at all events, feels, something distinctly "coming down" through the front passage. In slighter degrees the patient is not aware of this, but complains chiefly of pain. The pain is of a dragging, bearing-down character, felt in the lower part of the abdomen, low down in the back, and extending down the thighs, especially the left one. The pain is worse when the bowels move, owing to the straining increasing the degree of prolapse. The bladder is pulled upon, so that there is a very frequent desire to pass water. The most characteristic feature, however, is that the pain ceases entirely when the patient lies down, because then the falling down and dragging upon the nerves does not occur. If the pain does not entirely disappear in the recumbent posture, then the patient's troubles are not entirely due to prolapse, although it may be part of her ailment.

The treatment of prolapse may be one of two kinds: (*a*) mechanical, palliative; (*b*) surgical, curative. No medicines, douching, or anything of that kind is of the slightest value. The mechanical treatment consists in the wearing of a pessary. Pessaries are structures made of rubber, vulcanite, celluloid, or metal, and in the shape of a round or oblong ring. They have to be worn constantly inside the vagina, and act mechanically by keeping the womb in position. They are not curative, and the condition is practically certain to recur if they are left off. In many of the slighter cases they give almost complete relief, although there is generally a slight discomfort from them. A suitable one must first be selected by a doctor and put in proper position, and they must be removed at intervals of not longer than three months, to be cleaned and to see that no harm is being done by pressure from them. Serious ulceration and damage may result if pessaries are left in position too long without attention, and no pessary which causes pain or serious discomfort is carrying out its function, and should be removed and changed for another, or discarded. The drawback, therefore, to pessaries is the constant attention which is required so long as they are worn, for, in addition to the three-monthly removal for cleaning and inspection, the vagina should be syringed or douched out with warm water once daily. If the patient tires of the bother which this entails, or if pessaries are not found to give relief, then the only thing left is to have an operation to fix the womb in place. There are a number of different operations which have been devised for this purpose, most of them of a comparatively simple nature; and surgical operation which does away with all necessity of continual readjustment of pessaries can certainly be recommended in cases where the womb is not comfortably kept up by a pessary. In cases where a pessary does keep the womb in position an operation cannot be urged so strongly, because one must recognise that there is always a certain amount of risk attendant upon any operation, and this must be weighed against the undoubted benefits likely to accrue from the operation.

In backward displacement of the womb, which is often combined with a certain amount of prolapse, the symptoms are similar but the pain is more severe, and felt more especially low down in the back over the sacral bone, and it is not relieved so quickly on lying down. There is often pain on movement of the bowels, especially if constipation is present, because the womb is pressing backwards against the rectum. Sexual intercourse is generally painful. Treatment by means of a pessary will, in the case of backward displacement, be effective in by far the majority of cases, but the same remarks as for prolapse hold good as far as the necessity of having it cleaned are concerned. It may have to be in permanently, but quite a number of patients find that, after it has been worn for some months or years, it can be left off without the symptoms returning. Whether or not this will be the case cannot be told beforehand, but only by trying. In the few cases where a pessary does not give relief, an operation may be necessary.

Acute Pelvic Inflammations.—Inflammation with or without the actual formation of pus or abscess formation may affect the womb, the Fallopian tubes leading into it from the ovaries, the loose tissues around the womb, or the peritoneum covering the womb and other pelvic organs. It is needless to go into the differences between the inflammations of these various parts, because such a diagnosis can scarcely be made except by a doctor after a thorough examination. The symptoms do indeed vary considerably, but more with the gravity and acuteness of the particular case than with variations in situation. In the most acute cases the symptoms are very similar to those of acute peritonitis or of appendicitis. The patient has intense pain in the lower part of the abdomen, and, on attempting to feel it, the tenderness is such that the abdominal wall is held rigid; there is often vomiting; the patient is prostrate, and the expression worn and anxious; the pulse is very small and rapid; the temperature is generally, but not always, raised. The rapidity of the pulse is really a much better guide to the acuteness of the condition than the temperature is.

In less acute cases there is practically constant pain, only slightly lessened on lying down, and aggravated by doing practically anything; the periods are usually profuse and painful; there may be some feverishness, but it is not usually very great. Such symptoms may, if allowed to go on unchecked, last for months, turning the patient into a wreck.

Such conditions may occur from infection reaching the pelvic organs from the outside after confinements, or quite apart from any pregnancy; from infection extending through from the bowel; from rupture of tumours, &c., connected with the pelvic organs; or from other causes which cannot always be accurately determined. We must in this connection, however, lay stress upon the frequency with which acute pelvic inflammations, if not occurring after delivery, are due to *gonorrhœal infection.* Gonorrhœa in the female is a disease which may give rise to comparatively little trouble beyond a more or less persistent discharge (*Whites*—see below), so long as the infection does not extend higher up than the vagina; but, should it extend further, as happens not uncommonly, the results may be very serious and even dangerous to life, or, if not that, at least provocative of long-lasting misery. This word of warning must be given, owing to the frequency with which perfectly innocent women's lives are rendered a burden through being infected by their husbands, who have had gonorrhœa, it may be, years previously, and fancied that they were cured, but were in reality not so. (See *Gonorrhœa,* under Venereal Diseases.)

But little need be said about the treatment of this group of affections, because it is essential to obtain medical advice. Until this is obtained the patient should remain in bed, with poultices or hot fomentations over the lower part of the abdomen. In many cases an operation of one sort or another will be necessary, and may even be urgently required to save the patient's life.

Hæmorrhage.—This may be either internal or external, and we can first of all briefly dismiss the question of *internal hæmorrhage.* This is, fortunately, not very common, but when it occurs it may be so profuse as to endanger the patient's life from the rapid loss of blood into the abdominal cavity. The symptoms come on suddenly, often without any previous warning. The patient becomes deathly pale, the pulse rapid and almost imperceptible, the extremities cold, and she feels quite powerless and may faint. There is breathlessness, but no actual difficulty in breathing; there is little or no pain. Such internal hæmorrhage may, of course, occur from conditions not peculiar to women, such as rupture of a gastric ulcer. The commonest cause peculiar to women is the rupture of an extra-uterine pregnancy—*i.e.* one where the child has commenced to grow within the tubes leading into the womb instead of in the womb itself. Such a condition when it occurs is likely to rupture within the first three months of pregnancy. Treatment must be immediate and surgical, or the patient is almost certain to bleed to death. (See under Pregnancy, Complications of.) Another occasional cause is rupture of a cystic ovarian tumour, but this is not common nowadays, as these tumours are usually recognised earlier and removed. Here again urgent measures are necessary.

External Hæmorrhage.—Hæmorrhage appearing externally, either as an excessive loss of blood at the monthly periods or as irregular discharge of blood independent of the periods, may also be dismissed fairly briefly, not because it is unimportant —far from it—but because it is so important, and so impossible to detect the cause of the bleeding without an internal examination, that medical advice must be sought. The reader will find the question sufficiently fully discussed under the heading of Menstruation, Disorders of—*Excessive Menstruation and Bleeding from the Womb.* The condition is of great importance, because, if severe or long-continued, it leads to marked anæmia and seriously undermines the patient's health and strength, and because it may be, and often is, the first symptom of cancer and other serious conditions. The cause may be of a simple nature, and one which is fairly easily remedied, such as fatigue, shock, too much sexual excitement, residence in a tropical or enervating climate, the congestion which accompanies backward displacement of the womb or chronic inflammation of the womb, or when menstruation first appears, or when it is about to disappear at the change of life.

In the early stages of pregnancy it frequently indicates a threatened abortion, and, after an abortion or miscarriage has occurred, it may continue from everything not having come away. (See Abortion.) It may also be due to other and more serious complications of pregnancy, such as a wrong position of, or disease of the contents of the womb. But, on the other hand, hæmorrhage may be due to much more serious troubles, particularly growths. Some of these, such as fibroids, are not of a dangerous nature in themselves, but others are cancers, and, if not recognised and removed early, will inevitably lead to the death of the patient. On account of the frequency and importance of *cancer of the womb*, it is advisable to say a little more about it, and it may conveniently be done here. It is most common in women between the ages of thirty-five and fifty, but it may occur both earlier and later. A tendency to cancer may be inherited, but there is little evidence that this tendency is strong, or really has much to do with the development of cancer, either of the womb or anywhere else. It is certainly commoner in women who have had several children than in unmarried women. The first symptoms are usually hæmorrhage or leucorrhœa (*Whites*—see below); pain and wasting only come later. The white discharge is not at first offensive in character, although later on it frequently becomes so. The disease is for a considerable time limited to the womb, and can be removed with very little risk by operation, and with every hope of non-return; when once it has spread to surrounding structures the prospects of complete removal are not nearly so good.

It is on account of the impossibility of the patient herself determining what is the source of the hæmorrhage, and the grave results which follow on delay should the case be one of cancer, that we urge the importance of seeking medical advice early. This applies really to all cases of hæmorrhage, but more particularly in the case of any woman who has had children, and in whom any unusual hæmorrhage or discharge appears. (See also under Menstruation, Disorders of.)

Leucorrhœa, or Whites.—This means practically any discharge from the front passage which is not blood. It is usually of a whitish or yellowish colour, but may vary somewhat, both in appearance and amount, from time to time in any one individual. This condition may occur in females of all ages, and it will be convenient to describe the condition as it appears in children, in young unmarried women, in married women, and in old women.

In children there is not only discharge, but, if the legs are widely separated, the parts around the opening of the front passage will be seen to be all red and inflamed. It may be due to dirt, worms, or other causes, but by far the most common cause is gonorrhœa. This may be conveyed to children by criminal assault, but also in many other ways, such as dirty towels, utensils, or fingers, or contact with bedclothes on which there are recent gonorrhœal discharges. Fortunately the condition is usually very easily and quickly cured in children. The parts need simply to be thoroughly washed several times daily for a few days with some antiseptic lotion, such as saturated solution of borax or a 1 per cent. solution of protargol. The lips of the opening must be separated and the whole opening well mopped out, or, better, syringed out with a small glass syringe, so that the lotion when flowing out again bathes and washes the whole surface.

Whites are not common in young unmarried women, but, when present, are generally due to a catarrhal condition of the vagina, and will, as a rule, disappear by douching night and morning with a lotion made up by dissolving a few crystals of sulphate of copper (not more than half a teaspoonful) in a couple of pints of warm water. Very rarely the condition may be due to some growth.

A leucorrhœal discharge in married women may come either simply from a catarrhal condition of the vagina or from higher up—viz. from the womb —but the distinction between the two forms is only possible on medical examination. Discharge from the vagina comes on as a result of one of two conditions, child-bearing and gonorrhœa. After almost any confinement, however normal it may have been, there persists some discharge, and not uncommonly it persists for an indefinite time as a yellowish discharge commonly spoken of as "whites." The commonest (and least serious) form of gonorrhœa in women is also an inflammation of the vagina, evidenced mainly by a purulent discharge. At its commencement there is usually a little soreness and swelling, with smarting on passing water, because the inflammation extends into the urethra, or passage from the bladder. This then passes off, but a discharge remains. If treated properly it will usually disappear in about a couple of months, but if untreated it may persist indefinitely, giving rise to no symptoms beyond the discharge, but liable to infect any one coming into contact with the discharge. Not infrequently, however, the gonorrhœal infection extends higher than the vagina, and may give rise to exceedingly serious and dangerous complications. (See above, under *Acute Pelvic Inflammations.*) The treatment for either of these forms of vaginal discharge is as much rest as is practicable, and warm astringent douches every night and morning. The douche should be used as described above in the treatment of chronic ovarian pain, and the lotion used may be either half a gallon of warm water with a teaspoonful of sulphate of copper crystals dissolved in it, or else a similar amount of water containing from 20 to 40 grains of chloride of zinc, the weaker solution being used to begin with, gradually increasing the amount to the stronger.

If, after a couple of months, this has not cured the discharge, then advice had better be sought, because the discharge is probably coming from the womb, in which case vaginal douches alone will not be sufficient to effect a cure. Discharge from the womb is very commonly due to the presence of erosions about its neck, resulting from lacerations during childbirth ("ulcers on the womb" they are often called), and to get rid of these it is necessary to have the womb painted once a week for some weeks with mild caustics or burning agents, in addition to vaginal douches. When any unusual discharge appears, not specially after a confinement, the possibility of its being the first symptom of cancer must be borne in mind. (See above, under *Hæmorrhage.*)

Leucorrhœal discharge coming on in elderly women may also be due to cancer, but it is often due simply to a catarrhal condition which leads to very profuse discharge, and one which is very difficult to get rid of. The zinc chloride douche referred to above should be tried. The condition is sometimes so distressing that the womb is removed by operation, it being an organ no longer of any service.

Disorders of Menstruation.—These are described separately under the heading MENSTRUATION, DISORDERS OF.

Affections of the Vulva, or Opening of the Front Passage.—Itching of the parts around the opening is a common complaint. In some women it is always present for a few days after the periods come on, but passes off between times. It may be due to the presence of lice amongst the hairs, in which case a few nights' thorough soaking and rubbing with 1 in 40 carbolic lotion will destroy them and cure the complaint. Sometimes it is caused by simple lack of ordinary cleanliness. If there be any discharge from the vagina, this is very apt to cause itching if the parts are not kept clean. The treatment in this case is mainly directed to curing the discharge, as described above under *Leucorrhœa.* In patients with diabetes there is apt to be very distressing itchiness, and every time after passing water the parts should be washed with water containing a little bicarbonate of soda, and then thoroughly dried. Where there is any inflammation or ulceration about the vulva, there is almost sure to be itchiness or soreness. (See below.) Sometimes there is no obvious cause for the itching, especially in elderly women, and this is a form very resistant to treatment. The remedies mentioned under PRURITUS and ITCHING may be tried.

Inflammations and Ulcerations.—These are not very common, but form rather a miscellaneous lot, which are not easily distinguished. There is usually soreness and itching, and often some swelling. Such conditions as syphilis and soft chancre (see under VENEREAL DISEASES) and breaking down of tumours are amongst the commonest causes, and advice as to the nature and treatment of any such complaint should always be sought early.

Swellings about the vulva may be either of the nature of abscesses or tumours, and in this instance also medical advice is necessary.

Sterility.—Failure to have children after a marriage is by no means always due to some defect on the part of the woman. It may be caused by something wrong in the male partner, or it may really be due to no disorder on either side, but simply to some incompatibility between the particular pair. (See STERILITY.) It may, however, be brought about by congenital defects in the formation of the woman's reproductive organs, either internal or external. These are not necessarily discoverable except on minute examination, and are probably irremediable. It may also be caused by almost any of the diseases peculiar to women, and may be brought about either before marriage, as the result of marriage, or after having one child. Some cases are curable if the causal condition is relieved; for other cases there is no cure.

Sexual Troubles.—A certain amount of pain and difficulty almost always attends the first sexual intercourse, but intercourse is sometimes rendered impossible through congenital smallness of the vaginal opening. Such a condition can usually be remedied by a small operation. Pain, but without any particular difficulty, during connection points usually to some pelvic inflammation, prolapse of an ovary, or backward displacement of the womb. (See these conditions.) Any inflammation or ulceration about the vulva will, of course, also give rise to pain. There is a rare condition known as vaginismus in which there is no local disease, but, on any attempt at connection, the muscles surrounding the opening go into spasm, rendering connection quite impossible, and causing intense pain. This is really a nervous complaint. Some cases are curable by electrical or other means, some are not.

Abnormalities of sexual feeling have really nothing to do with the local organs, but with the nervous system. Either absence or excess of sexual feelings may be present with perfectly healthy organs and functions, although sometimes such disturbances are caused by diseases of the nervous system. They are in any case troubles concerning which the less they are thought about the better it will be for the peace of mind of the individual.

Abdominal Tumours.—Cancer of the womb is, of course, strictly speaking, an abdominal tumour, and in advanced stages may be of sufficient size actually to give rise to a swelling in the lower part of the abdomen; but we wish here to refer merely to those forms of tumour which draw a patient's attention to them first from the fact that there is an obvious, visible, or palpable tumour or swelling appearing in the lower part of the abdomen. These tumours are fairly common, and are, in the vast majority of cases, one of two sorts—viz. either cystic tumours of the ovary, or solid fibroid tumours of the womb. Both sorts sometimes grow to an enormous size if left long enough; in other instances they may remain indefinitely of comparatively small size and quite harmless, but they are liable at any time, and for no very obvious reason, suddenly to commence to grow rapidly. They occur in women of all ages, and married or unmarried. The fibroids of the womb are comparatively harmless, and, unless growing rapidly or giving rise to trouble of other kind from pressure on surrounding organs, hæmorrhage, &c., may in most instances be safely left alone. Ovarian tumours, on the other hand, are best removed if they are of a size large enough to be giving rise to visible swelling. (Some are detected first through symptoms of pain, hæmorrhage, &c.) Some are malignant from the outset, most are of an innocent, non-dangerous kind at first, but there is a liability on their part to assume malignant characters later on in their history, so that the patient is better to be without them.

Symptoms connected with the Passing of Water.—Simple *too frequent passage* of water, without any pain during the act, may be due to diabetes, Bright's disease, or other forms of kidney disease, or to cystitis or other affection of the bladder. (See under these headings.) It is commonly present from slight degrees of prolapse of the womb, so slight that the patient is not aware of anything coming down, and with no other symptom beyond some backache. Such cases usually date from a confinement. They can be rectified by wearing a pessary. The irritation of a badly-fitting pessary may be a cause of too frequent desire to pass water. If the bladder has ever been allowed to become over-distended, a condition of loss of tone of its walls is apt to result, and lead for some considerable time afterwards to frequent passage. (For bed-wetting at night in children see under BLADDER, DISEASES OF THE.)

Pain on passing water, a smarting or scalding sensation, is a pretty common complaint. In its slighter degrees it may be due to over-concentration of the urine, a form which will be cured by the patient drinking more fluid. It commonly accompanies almost all inflammations of the pelvic organs, but is then generally a symptom of little prominence compared with the others present. In gonorrhœa it is generally complained of for a week or two during the acute stage of the disease, from the inflammation in the urethra. (See under *Leucorrhœa.*) Severe pain may be due to the presence of an urethral caruncle, a small growth which sometimes forms, usually in women of middle life, at the external opening of the urethra, and which is only curable by surgical removal. It may also occur from disease of the bladder.

Incontinence of urine (*i.e.* inability to retain water, with continual dribbling away) and *retention of urine* (*i.e.* inability to pass any urine at all) are both serious complaints, and need skilled advice and attention. The former is usually due to some false passage having formed in connection with the bladder, and needs surgical repair; the latter may be due to some nervous disease, either hysteria or gross organic disease, but is very commonly caused by a displaced womb, or a fibroid or other form of growth, becoming more or less suddenly jammed in the pelvis and compressing the urethra, or passage from the bladder to the exterior, so that it becomes a physical impossibility to pass urine. Temporary relief may be obtained by sitting in a bath of hot water or by having a catheter passed, but very often some operation is required.

Pain when the bowels move may be due to constipation, where hard lumps have been allowed to form, or it may occur from any disease of the rectum or anus, such as piles, pruritus, fissure, prolapse, or cancer. (See PILES, and RECTUM AND ANUS, DISEASES OF THE.) It may also be caused by prolapse or backward displacement of the womb, or by a prolapsed and tender ovary, or local peritonitis in the pelvis. In the two latter instances the pain is usually complained of as commencing some little time before the bowels move, but continuing for some time afterwards.

Inability to retain the motions is usually the result of some injury to the parts between the openings of the front passage and that of the bowel during a severe labour, and requires surgical repair.

Wooden Tongue.—See ACTINOMYCOSIS.

Woolsorter's Disease.—See ANTHRAX.

Worms.—See under PARASITES.

Wounds.—See section of the book dealing with First Aid.

Wrist-joint, Affections of the.—Sprains at the wrist-joint are common, but are not always readily distinguishable from fractures of the small bones at the wrist, or from a fracture of the lower end of the bones of the forearm. (See under First Aid section.) Another common result of straining the wrist is a chronic inflammation of the sheaths of the tendons running over the wrist-joint, resulting in swelling, a feeling of weakness, and often a peculiar creaking sensation on movement. (See under TENDONS, AFFECTIONS OF.) The wrist-joint may also be the seat of tubercular disease, especially in young people, resulting in a cold abscess with swelling. (See ABSCESS, *Chronic.*) Small, localised, elastic swellings at the back or front of the wrist, known as "ganglia," are not uncommon. (See GANGLION.)

Wrist-drop.—See DROP-WRIST.

Writer's Cramp.—See under CRAMP.

Wryneck.—See under DEFORMITIES.

Yaws.—An infectious tropical disease, not unlike syphilis in character, and now known to be caused by a spirochæte very like that which is the cause of syphilis. The disease is also known by the names "pian," "bubas," "frambœsia," besides a host of local native names. It occurs in almost all parts of the tropical zone, but practically never outside it. The symptoms, like those of syphilis, may be divided into three stages. First there is the primary sore, but, unlike syphilis, this is not usually about the private parts, nor is the disease one usually communicated from person to person during the act of sexual connection, although it may be so occasionally. The disease is one, however, which is infectious, the infection being spread either by direct personal contact, or perhaps sometimes through the medium of flies and other insects, which will often be observed upon the sores of a patient with yaws. The infection with the causative germ requires some broken skin whereby to enter, but the slightest abrasion of the skin may be sufficient. Some two to four weeks after the infection takes place the primary sore appears, and during the interval the individual may feel slightly out of sorts. The primary sore is at first merely a small pimple, which, after about a week, becomes moist and covered with a yellowish crust, and, if the crust be removed, there will then be found to be a clean-cut small ulcer underneath. This sore may heal before the secondary stage comes on, although, as a rule, it is still present.

The secondary stage is characterised mainly by the occurrence of a general eruption over the body, and it commences in from one to three months after the first appearance of the primary sore. This eruption consists of pimples or yaws, which may grow to the size of a hazel-nut, covered by yellow crusts like that on the primary sore. On removal of the crusts there is seen a raw red surface like that of a raspberry, from which is derived one of the names of the disease—"framboesia." Each "yaw" usually lasts about three or four months, and a dark, pigmented area is left where it heals. During this stage the patient often suffers from constitutional symptoms. Thus there may be enlargement of the lymphatic glands in various parts of the body, swelling of joints, neuralgic pains, severe sweating, &c. The disease may die out with this stage—*i.e.* six months or a year after its onset—but, if the infection does not become extinct then, it may pass on to a tertiary stage, with symptoms lasting for years. These consist of nodular swellings, or gummata, which tend to break down into deep ulcers, just as in the case of syphilis. These may develop in any part of the body, but are probably most common in the bones.

Yaws is not a hereditary disease like syphilis—indeed, unlike that disease, parents are probably more often infected from their children than vice versa. The disease is not often a dangerous one to life, but its long duration, contagiousness, and power of disabling from work render it a very serious malady.

The best treatment appears undoubtedly to be the internal administration of iodide of potash. This may be given thrice daily in 15-grain doses for an adult, 5-grain doses for a child, the powder or crystals being taken dissolved in water. If symptoms of iodism (running at the nose, red rashes, &c.) set in, treatment may be suspended for a few days. This should continue for some months after the disease has apparently disappeared, as experience has shown that otherwise symptoms may return. The skin should be washed twice daily with a 1 in 1000 corrosive sublimate lotion, and any ulcerated sores dusted with iodoform or boracic acid powder.

Yellow Fever, or Yellow Jack.—This is a severe disease, characterised usually by two paroxysms of fever, and accompanied by jaundice and hæmorrhages. The illness is not a contagious one, but is now known to be spread solely through the medium of the bites of a certain species of mosquito (*Stegomyia calopus* or *S. fasciata*, as it used to be called). The living germ which is the immediate cause of the disease seems to be one of ultra-microscopic size, for the disease has been communicated experimentally by the inoculation of blood from an individual suffering from the disease, after filtration through the finest Pasteur-Chamberland filter. The disease is endemic in the West Indies and on the Atlantic coasts of Mexico and Central America, and extending from there as far north as Charleston and as far south as Rio de Janeiro. These limits correspond with the distribution of the *Stegomyia calopus*, and the fact that the disease is more marked in the warm season is also in keeping with the habits of the mosquito. The disease may be spread to further parts by ships carrying infected mosquitos, and one portion of the globe in which outbreaks commonly occur—if, indeed, the disease has not actually obtained a permanent footing there—is the West Coast of Africa, between Senegambia and Portuguese West Africa. No other species of mosquito has so far been proved to carry the infection, nor can the disease be acquired in any other way than through the bite of an infected mosquito (experimental inoculation of infected blood excluded).

The symptoms come on from three to seven days after infection, the first symptoms being a feeling of coldness, sometimes with shivering attacks, severe headache, and pains in the back and limbs; then the face becomes flushed, the temperature rises to about 103° F. or more, and the pulse becomes rapid and bounding. The appetite is lost, there is often vomiting, the urine is diminished in amount, and on examination it will be found to contain albumin. In from two to four days the temperature may fall by crisis to normal, with profuse sweating, in which case the attack is over. More commonly, however, the temperature does not come completely down; there is merely a few hours' remission, during which the patient feels much better; then the temperature begins to rise again, but this time the pulse-rate does not increase *pari passu* with the temperature, but, on the other hand, tends to become slower and slower. During this second attack the symptoms of the first return, with, in addition, jaundice, which gradually deepens as the illness proceeds; vomiting, with severe prostration; and the occurrence of hæmorrhages from the nose, mouth, womb, &c. The vomit may also be red or black from the presence of blood in it—a bad sign. The urine becomes very small in amount, and contains a large quantity of albumin. After three or four days the disease will either take a turn for the worse or for the better, the symptoms gradually improving or becoming more pronounced, with, not infrequently, a fatal result. All cases must be regarded as serious, although the mortality varies very much in different epidemics and places. Any pre-existing disease as a complication, or the occurrence of very high temperature, marked diminution in the excretion of urine or complete cessation thereof, black vomit or the appearance of hæmorrhages under the skin, make the outlook grave. An attack confers lifelong immunity.

Treatment.—(*a*) *Preventive.* In an endemic area yellow fever may be stamped out, as is shown by the magnificent work of the American sanitary authorities in "cleaning up" Havana and in the Panama Canal zone. The chief measure is to eradicate the mosquitos by destroying all possible breeding-places, in the same way as the anti-malaria campaigns have been carried out—*i.e.* covering in or draining all pools of stagnant water, including such seemingly harmless collections as those in old tins, gutters, hollows in the roads, &c. All persons suffering from the disease must be strictly isolated and treated in mosquito-proof rooms, so as to prevent the mosquitos from becoming infected and spreading the disease. Rooms where infected persons have been should be thoroughly disinfected by burning sulphur or tobacco (2 lbs. per 1000 cubic feet of air in the room). Houses and public buildings should, as far as possible, be rendered mosquito proof by the use of screens with a mesh not larger than 20 to the inch, and all persons, immune or non-immune, should sleep inside mosquito curtains. The mosquito, it may be mentioned, is active between the hours of 3 P.M. and early morning, but not between 9 A.M. and 3 P.M., during which time there is practically no risk of infection being spread. In the case of ships coming from infected ports, they should be anchored a quarter of a mile from the shore and other ships, the sick removed to a mosquito-proof hospital, the remainder of the crew and passengers quarantined for one week, and the whole ship disinfected by means of Clayton's sulphur dioxide apparatus.

(*b*) *Of Actual Cases.*—This should begin with a small dose of calomel (2 or 3 grains, in pill or powder form), followed by a Seidlitz powder or a tablespoonful of Carlsbad salts in a tumblerful of water next morning. After this the bowels are best kept acting regularly by enemata of a tablespoonful of sulphate of soda in a pint of warm water, given every night and morning. After the calomel is given the patient should take a warm bath or a mustard foot-bath, and be wrapped in blankets to promote sweating. Throughout the whole attack abundance of liquid must be drunk, so as to dilute the poison in the blood, and to encourage its excretion by the kidneys. Several quarts of iced Vichy water may be taken in the twenty-four hours, or the following draught may be made up:

℞ Bicarbonate of soda	150 grains
Corrosive sublimate	⅓ grain
Water	to 3 pints

Dissolve. Take three tablespoonfuls in a little extra water every hour.

Vomiting should be treated by sips of iced water containing a little bicarbonate of soda, iced champagne, and a blister on the pit of the stomach. Where the fever is very high the patient should be sponged frequently with cool water, and cold cloths applied to the head. Vomiting of blood should be treated by an ice-bag over the stomach. If the amount of urine being excreted is very small, hot fomentations ought to be applied to the loins over the kidneys. While the fever is at its height no food need be given for several days, only the alkaline drinks and champagne. After this, when the temperature falls below 102° F., milk diluted with lime-water or barley-water may be given, and, after the temperature has been down to normal for two or three days, jellies, milk puddings, &c., and the diet gradually increased as the patient gains strength.

Zona and **Zoster** are names sometimes applied to herpes zoster, or shingles. (See SHINGLES.)

FIRST AID

By First Aid is meant the assistance which can be given in cases of accidents or emergencies by those who, with certain easily acquired knowledge, are in a position not only to relieve the sufferer to a considerable extent, but also to prevent any further mischief being done pending the arrival of a medical man. Consequently it will be realised that the extent of the first aid depends largely, in the hands of one possessing such knowledge as will be gained by a study of this section, on the distance from proper medical help. In towns where a doctor can be summoned without much loss of time, we need what may truly be called First Aid: in distant and outlying parts much more can be done to alleviate the suffering and promote the physical and mental well-being of the patient, if not, indeed, to hasten the recovery, and many lives have been saved by the prompt action of the man on the spot in cases of accident. There are a few general principles on which anyone can act. Above all, it is necessary to keep cool and collected; much can be done quickly without the appearance of hurry and panic so distressing to everyone, and not the least to the patient. In many cases there is more bother with the crowd of well-intentioned, yet helpless, sympathisers which invariably gathers than with the case in hand. The calm and collected assumption of authority, backed up by the obvious knowledge of what is the correct method to adopt, goes a long way towards dealing successfully with an excited crowd. Tact is here almost a necessity. We might parody the well-known saying and get one, the force of which is equally apparent, "Tact is stronger than friction." The somewhat hampering attentions of the onlookers may be turned into other channels by a few tactful remarks. Everyone, as a rule, wants to help, but knows not what to do. One and another may be sent off on various errands. Some may be given unimportant details to attend to, and all will be pleased at the thought that they are getting something to do. As much air and free space is necessary as can be obtained; ask a few of the crowd to act as policemen in keeping the others back as far as possible.

Should there be an obvious cause of injury or danger, it must be removed as soon as possible, and in the case of more than one injury, discretion must be exercised as to which to tackle first. In all cases where there is bleeding, the first object must be to control this by whatever means is most convenient and suitable. With any accident there is always a certain amount of shock: the best means of keeping this as small as possible is by warmth. See that the patient is well covered up and in the position of greatest comfort compatible with the injuries. It is not usually necessary to remove any clothing, but in cases where it is advisable, this must be done with the minimum of discomfort to the patient, regardless of the consequences to the clothes. In removing a coat the sound arm should be withdrawn first: this will enable the sleeve to be pulled gently off the other arm without much trouble, or it may be necessary to rip up the sleeve on the affected side. A shirt should be completely slit up the front, and removed in a similar manner to the coat. Trousers can be easily removed by slitting up the outer seam, and boots by slitting up the back seam and removing the laces. Socks should be cut off, preferably by a pair of blunt-pointed scissors.

Care must be exercised in attempting to stimulate a person who has met with an accident. Spirits should not be rashly given, nor, indeed, should anything, till it is certain that the patient can swallow. A drink of water, milk, tea, or coffee is all that should be given. Smelling-salts may be applied to the nose, and cold water applied to the face and head.

In the excitement of the moment, what is everybody's business is apt to be no one's; and it is too often taken for granted that medical aid has been summoned, though no one has actually been sent. The person who takes charge of a case must see to it that someone has gone for a doctor at the very beginning. Should the doctor arrive immediately, the case is in his hands, and the best thing has been done for the patient; should there be a delay, it is not due, in any way, to the person who sent for help at once, and in the meantime much may be done till the doctor arrives.

BANDAGING

Bandages are used for various purposes, the chief of which are:

- To fix dressings and splints in contact with the parts to which they have been applied.
- To secure a displacement and prevent its becoming worse.
- To support an injured part.
- To arrest hæmorrhage.

There are certain recognised forms of bandage and methods of bandaging, many of which it is impossible to carry out in first-aid work, where it is often necessary to make use of any material which comes to hand. But in order to adapt such materials to the best use, it is necessary to know the proper bandages required, and the proper methods of use. By so doing, it is all the easier in cases of difficulty to exercise one's ingenuity and resource in approximating as closely to the ideal as possible and in utilising in the best way the materials at hand. Bandaging is a matter of practice, and a very useful degree of proficiency can be attained by anyone without much difficulty. The principles of bandaging should be known to all: no one knows when such knowledge may be of the greatest assistance. We shall, first of all, describe the correct methods of bandaging, and then give some hints as to what should be done in cases of emergencies when the usual appliances are not available.

The two chief varieties of bandages are known as the Roller Bandage and the Triangular Bandage. Each has its own special uses, the latter, perhaps, being more of the nature of a first-aid appliance.

The Roller Bandage

The roller bandage is a long strip, some five or six yards in length and varying in width, of some woven material rolled up into a cylinder. Unbleached calico is not so much used now as formerly, but makes excellent bandages for first-aid work. A house should never be without bandages of some kind, whether they be the finished article to be purchased at any chemist's, or merely the home-made variety. The latter can be very effectively made from two pieces of calico, each about six yards long and a yard in width. These should be torn into strips, 1 inch, 1½ inch, 2½ inches, 3 inches, and 4 inches wide. This will give us nine bandages, each an inch in width: six at 1½ inch, eight at 2½ inches, eight at 3 inches, and three at 4 inches. The narrowest bandages are for use on finger and toes, those at 2½ inches for head and upper limbs, those at 3 inches for the lower limbs, while the widest of all, 4 inches, are used for the trunk. These must be rolled up tightly, either by a special machine or by hand, and the free ends kept in position by safety-pins. This ensures the presence of a safety-pin to finish the bandaging off when it is used.

Rules for Using.—The following rules for bandaging should always be borne in mind by anyone who attempts to make use of the roller bandage. Their observance will not only give greater facility in applying the bandage, but will enable a much more satisfactory and efficacious bandaging to be performed.

The rolled-up bandage should be held in the palm of the hand, between the fingers and the thumb, not lengthways between the forefinger and thumb.

In bandaging a limb on the right side of the body, the bandage should be held in the left hand, while for a limb on the left side it should be held in the right hand.

Always bandage a limb from below upwards.

The bandage should pass from the inner to the outer side across the front of the limb.

Always begin by making a few fixing turns of the bandage round the part to which it is first applied. Two turns are usually sufficient.

Care must be taken not to unroll too much of the bandage and have a loose loop of material hanging between the hand and the limb to be bandaged. No more than three inches should be unwound at the same time. Failure to attend to this prevents evenly distributed pressure throughout the bandage.

Apply the bandage with the same pressure on the part all along. Attention to the foregoing rule will ensure this.

Each succeeding turn of the bandage should overlap two-thirds of the previous turn. This gives a firmer support and helps to retain the bandage in position.

When a bandage has to be applied leaving two skin surfaces in apposition, they must be separated by some padding such as cotton-wool.

The bandage is finished off, as it was begun, by making a few fixing turns round the limb, and fastening with a safety-pin. If no pin is at hand, it may be fastened as follows: Split the bandage longitudinally up the centre for four to six inches. Twist the two ends or tie them together at the fork to prevent further splitting. Continue one portion round the limb in the same direction as the bandage, and turn the other round in the opposite direction. When the two meet, they can be tied in a reef knot. Care must be taken not to tie these ends too lightly round the limb or the circulation may be seriously interfered with. The pin in the knot should always be to the outside.

Do not apply a bandage too tightly so as to interfere with the circulation. If the fingers or toes be left exposed and become pale and cold, the bandage has been too tightly applied. No additional pain or discomfort should be caused by a properly applied bandage: on the contrary, the patient should experience considerable relief.

In removing a bandage, use both hands, which are kept close to the limb, one on either side. Do not allow the bandage to hang in a long trail from the limb: gather it up in a bundle in the hand, and pass the gradually increasing bundle from hand to hand round the limb till finally the completely removed bandage lies compactly in one hand.

Always commence by applying the outer surface of the bandage to the limb, keeping the roll away from the skin surface, *i.e.* the roll is uppermost in front, but below when it is passing underneath the limb. It will be seen later that when reversing is necessary, the position of the roll is sometimes changed, but in all cases the beginning must be the same.

To Roll up a Bandage.—While this can be done most effectively by a special machine for the purpose, it is neither necessary nor likely that one is at hand. The following method is simple and expeditious. Straighten out all twists or tangles in the bandage, and let it lie stretched out on the floor. Fold over one end of the bandage for a few inches and commence making the roll by repeatedly turning or folding the end with the fingers. When a beginning has thus been made, place the rolled-up end high up on the right thigh, allowing the remainder of the bandage to lie along the thigh. Lightly place the right hand flat on the roll and run it down along the bandage, so as to include the length of the thigh in the roll. Lift the roll up again to the top of the thigh and repeat the manœuvre till the whole length is included in the roll. This will be found to be a much quicker and easier method than attempting to complete the roll by means of the fingers and thumbs.

Reversing.—In bandaging the wrist or ankle the first few turns of a spiral bandage will be found to lie evenly and regularly following these directions, but as the forearm or calf is reached it will be found impossible to continue in this manner and obtain a neat and effective bandage. The lower edge will be looser than the upper, or if an attempt is made to keep the lower edge lying flat and even along the surface, it will be found that uncovered spaces appear between successive turns. The explanation of this is simple, and a proper understanding of it is the key to successful bandaging. The limbs are made up of sections which are either cylinders or cones. The wrist and ankle neighbourhoods are simple cylinders, and may be bandaged perfectly by a simple spiral bandage as shown. The forearms and calf are truncated cones: here a modification is necessary. This modification is known as reversing. When a section of a cone is reached, we proceed as follows: Keeping the lower edge of the bandage approximated to the surface, it is found that the necessary amount of overlapping is not being obtained. Holding the roll of bandage in the right hand, palm uppermost, the thumb of the left hand fixes the lower edge of the turn on the upper aspect of the surface of the limb somewhat towards the outer side. The right hand, holding the roll, is now turned completely round so that the palm looks downwards and the strip of bandage will have turned over on itself. The turn is now completed by passing the roll underneath the limb as in ordinary spiral bandaging, and the same process is repeated on the front surface of the limb. In this way it will be found that the bandage lies evenly and covers the surface completely leaving no blank spaces. The bandage is finished off by a few fixing turns as before.

It will be noticed that the roll of bandage alternates its position, lying now between the turn to be applied and the limb, now with the turn between it and the limb as is constantly the case in applying an ordinary spiral bandage. To ensure a neat appearance of the bandage, care should be taken to have all the crossings or reverses running up the limb in a straight line.

Bearing these points in mind, anyone, with a like practice, can become an expert bandager. Success, however, is only to be attained by practice, but the enthusiastic amateur usually has no difficulty in finding friends willing to lend their services in acting as models. Not only is their interest stimulated, but the positions of bandager and model may with convenience be reversed, with satisfactory results to both.

Special Forms

Special forms of the roller bandage are used for special purposes, and are made by tearing off the necessary lengths of a single bandage and by stitching them together in the required manner. The more important of these deserve a short notice, as they will be found of immense service in particular cases.

The Four-Tailed Bandage.—Take a piece of the 4-inch bandage about 3 feet in length. Double this in two so that the length is now a foot and a half. Starting from the free ends, tear the bandage longitudinally down the centre to within two or three inches of the fold. Make a small slit, rather less than an inch in length, along the centre of the untorn portion from the fold. The bandage is now opened up, and is ready for use in cases of fracture of the lower jaw, or to retain a dressing to the chin. The method of application will be seen in a further section.

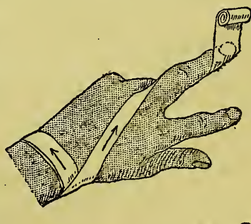
The T-shaped Bandage.—This is made by stitching together two pieces of 3-inch bandage to form a T. The horizontal portion is about 4 feet in length, and the vertical, which is attached to it at the middle point, as about 3 feet long. By spliting the vertical piece up the centre, we have a double T-shaped bandage. The uses of these will be shown in a further section.

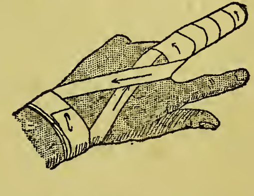
The Many-Tailed Bandage.—This is made by stitching several, six to twelve, according to requirements, pieces of 3-inch bandage, each about 4 feet in length, to a long vertical piece which lies along the centre of the former. The first transverse piece is stitched to the vertical first, and the second is then stretched so as to overlap the first. Each succeeding strip is so stitched as to overlap the preceding. This bandage may also be improvised from a large piece of calico or flannel by tearing it into strips from each side to within a couple of inches of the centre. While this is simpler and quicker, the resulting bandage is not nearly so effective, as the tails will not have the desired overlapping.

The Figure-of-Eight Bandage.—This bandage is applied to a part where sections of two cones meet, as at the knee and elbow-joints, where neither a spiral nor a reverse bandage is sufficient. In bandaging the leg, we reverse as we approach up the calf towards the knee. Just below the knee, however, we carry the bandage round the back of the joint in an upward direction to appear above the joint on the front of the thigh, and then down behind and round to appear on the front of the leg below the joint and just above the last turn there, slightly overlapping it. In this way, a figure-of-eight is made round the joint. By repeating this process we gradually enclose the whole joint with a firm bandage which has no tendency to slip.

The Spica Bandage.—This is a modified figure-of-eight bandage, and will be described in detail in the proper sections.

To Bandage the Finger.—Take a bandage of ½ or 1 inch according to the size of the finger. Turn the back of the hand upwards and separate the finger to be bandaged as much as possible from the others. If the finger to be bandaged is on the right hand, the bandage should be held in the left hand, and if it is on the left hand, it should be held in the right. This rule must always be remembered in applying a roller bandage to a limb. We will suppose that the injured finger is on the left hand, consequently the bandage is held in the right hand. Commencing at the root of the thumb, carry the bandage over the back of the hand from within outwards, and make two or three fixing turns round the wrist, bringing

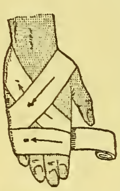




the bandage back to the root of the thumb and then on to the root of the finger to be bandaged. A long spiral movement now carries the bandage to the tip of the finger, which is then covered by a series of spirals down to the root, each successive spiral covering two-thirds of the previous turn. When the root of the finger is reached, the bandage is passed along the back of the hand to the little finger side of the wrist, and a turn is made round this to fix the bandage. The end may now be pinned in position, or if a portion was left free at the beginning, the two ends may be tied in a reef knot. All the fingers or more than one may be bandaged in this way, but between each two a fixing turn must be made round the wrist.

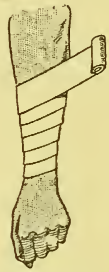
To Bandage the Thumb.—Use a 1-inch bandage, and commence at the root of the thumb with two or three fixing turns as above. In this case, the bandage takes the form of a spica, figure-of-eight turns being made around the wrist and then around the thumb till the latter is covered. The fixing turns having been made, the bandage passes along the palm of the hand to form a loop round the root of the thumb from within outwards, and back again round the wrist. The process is repeated, each turn overlapping two-thirds of the previous one till the thumb is completely covered in, when a couple of finishing turns are made round the wrist and the ends tied or pinned.

To Bandage the Hand.—This can be done by means of figure-of-eights or by the following method, which is the more satisfactory. As there will be skin surfaces in apposition between the fingers, pads of cotton-wool must be placed between the fingers. Use a 2- or $2\frac{1}{4}$-inch bandage, and begin at the base of the first finger. Take the bandage over the back of the hand to the wrist, round to the front of the base of the thumb, and across the back of the hand to the tip of the little finger. Now bring the bandage along beneath the tips of the fingers, which are left exposed, to the tip of the forefinger and across again to the tip of the little finger. In this way the bandage is fixed, and we now proceed to bandage up the fingers by further turns of the bandage. It will be found that, as the fingers are broader at the bases than at the tips, simple spiral turns will not do, and reverses are necessary. These are made in the manner already indicated, and by means of them the bandage is brought to the root of the thumb. A few turns are now made round the wrist to finish off and the end is pinned. This bandage does not include the thumb. The thumb, of course, may be included, but it is better to bandage it separately, if necessary, as it gives a better result and is more comfortable.

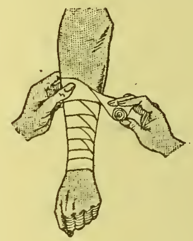


To Bandage the Closed Fist.—In bandaging the closed fist, there are skin surfaces in contact, hence we must not only place a pad in the palm of the hand, but also put some cotton-wool between the fingers. Begin with a couple of fixing turns round the wrist, then carry the bandage over the back of the hand to cover the little finger all round, and to project for an inch beyond it. The bandage is brought over the tips of the fingers on to the wrist at the root of the thumb and a loop is made round the wrist. Similar figure-of-eight loops cover in all the fingers, the last loop projecting an inch beyond the margin of the forefinger. Next the bandage is passed round over the bent fingers, and the loops covering them, round the side of the forefinger, covering the projecting margin of the bandage, across the back of the hand to cover the margin at the little finger. Two or three turns are made in this way, and the bandage is finished off by a turn or two round the wrist.

To Bandage the Forearm.—In its lower third the forearm is a cylinder, and above this it is cone shaped; consequently, while simple spiral turns are all that is needed in the lower part, a reversed spiral is necessary in the upper part. Commence with a few fixing turns at the wrist, going from within outwards over the limb, and end with a few finishing turns before securing the end with a pin.



Simple spiral.



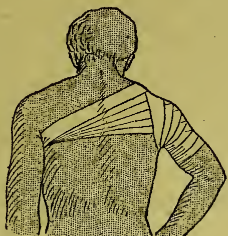
Reverse spiral.

To Bandage the Elbow.—Here a figure-of-eight is employed. Make two fixing turns round the upper part of the forearm, then carry the bandage upwards across the bend of the elbow, from within outwards, to cross the back of the upper arm above the joint, then downwards over the front of the joint to the forearm, and repeat, each turn overlapping the previous one, till the elbow is completely covered in. Finish off with a couple of finishing turns round the upper arm and pin the end.

Figure-of-Eight.

To Bandage the Upper Arm.—Begin with a couple of fixing turns and proceed with simple spirals. It may be found that reverses are necessary, though this is not always the case. The bandage is finished off with two finishing turns, and the end secured with a pin. It will thus be seen that to bandage the whole arm we commence with a spiral at the wrist. This is succeeded by a reversed spiral; then at the elbow there is a figure-of-eight, and the upper arm is covered by means of a simple spiral or it may be with a few reverses.

To Bandage the Shoulder.—To enclose this joint we employ a spica. Use a 3-inch bandage, and commence with a couple of fixing turns half way down the upper arm. A few turns are made up the arm towards the shoulder, and the bandage is then carried across the back to the opposite armpit, and over the front of the chest and shoulder back to the bandaged limb. The bandage is then taken round the limb and across the body as before, till the whole of the shoulder-joint is covered. A final fixing turn round the chest enables the bandage to be secured in position, the end being pinned.



To Bandage the Arm-pit.—After a few fixing turns round the upper arm, proceed to make a figure-of-eight bandage, one loop of which encircles the shoulder-joint from before backwards, while the other loop encircles the chest, passing underneath the opposite arm. This bandage is used to retain a dressing or fomentation in the armpit.

To Bandage the Chest.—The difficulty in bandaging the chest arises from the tendency which the bandage has to slip down, this being due to the fact that the chest decreases in circumference from above downwards. To overcome this tendency we secure the bandage by means of a suspender or brace. The simplest method of doing this is to take a piece of 4-inch bandage and split it along the centre for a sufficient length to allow the patient's head to pass through, the ends then lying one on the chest, and one on the back. These ends must extend well down over the abdomen in front, and to a corresponding point on the back.

Bandage with suspender.

With a 4-inch bandage complete a couple of fixing turns round the lower part of the chest, over the ends of the brace, and proceed with reversed spirals to cover in the whole chest well up to the armpits. Finish off with a couple of fixing turns and secure the end with a pin in front. The free ends of the brace are now turned up over the bandage and fixed to it by safety-pins both in front and behind. Two braces may be used, one passing over each shoulder and finished off in the same manner.

To Bandage the Breast.—This is done by means of a figure-of-eight bandage, one loop encircling the body, and the other the opposite shoulder. Use a 3-inch bandage, and begin with a couple of fixing turns around the body below the breast, going from the affected to the sound side. Next carry the bandage below and over the breast across to the opposite shoulder: then down across the back to the front of the chest, and round the body below the breast. Several turns are made in this way, each one overlapping two-thirds of the previous one till the breast is covered in, and the bandage is then fixed by a turn round the body. Safety-pins may be inserted at intervals in the bandage on the front of the chest to keep the crossing loops in position and prevent any slipping. Both breasts may be bandaged at the same time, remembering always to bandage the breast from below upwards on each side.

Bandage for right breast.

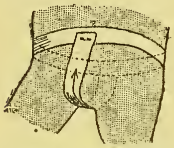
To Bandage the Head.—For first-aid work the best bandage is, undoubtedly, the triangular, but there are certain methods of applying the roller bandage which should be known.

The Capeline bandage (below) is made by stitching together two 2-inch roller bandages, with the rolls on the same side of the bandage. To apply the bandage, the patient should be seated, and the attendant standing behind, with one roll of the bandage in each hand, places the middle of the bandage on the forehead. The two portions are then brought round and crossed well down on the back of the head. One of the ends is continued round to the front, while the other, which passed below it, is turned up over the crown and brought forward to the middle of the forehead. Here it is crossed by the horizontal portion, which passes on to the back of the head once again. The hanging portion is now turned up over this band and passed back over the crown slightly to one side of the previous strip, which occupies the centre. When it reaches the back of the head, it is crossed again in the middle line by the horizontal band, over which it is turned, and brought forward to the forehead over the crown, but now to the opposite side of the centre strip. It is here again secured in position by the horizontal band and turned back again over the crown, getting further away from the centre strip on each side till the whole head is covered in. A complete turn of the horizontal band fixes all in position and the ends are pinned. To prevent any slipping, it is best to apply a turn or two under the chin and over the head, when the bandage is complete, and fasten with safety-pins.

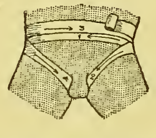
The knotted or twisted bandage for the head is exceedingly useful to secure pressure at a given point in cases of hæmorrhage. The bandage is unrolled for about a foot, and the end held in the right hand close to the temple. The roller is then carried round the head at the level of the forehead till it comes back to the unrolled end. Over this it is twisted and carried down below the chin, and up over the opposite side of the head till the free end is met at the original starting-place. Below this it is again twisted and passed horizontally round the head as before. This process is repeated till sufficient pressure is made, or till as much of the skull as is necessary is covered over, and the bandage is fixed by knotting the ends together.

To Bandage the Eye.—Use a 2-inch roller, and begin with a fixing turn round the head above the ears, starting from the uninjured side. When the starting-point is reached, the bandage passes over the affected eye and below the ear on the same side, round the head and back to the forehead. As many turns are made as is considered necessary, and the end of the bandage is secured by means of a safety-pin. The other eye may be bandaged at the same time by bringing the bandage round below the other ear and up over the other eye, thus forming a crossed bandage.

To Fix a Dressing between the Legs.—A simple method of doing this consists in using the T-shaped bandage. The horizontal band is fixed round the abdomen just above the haunch bones and the vertical band is brought through between the legs from behind, and is pinned to the horizontal band in front. It is better to use the double T-shaped bandage than the single, as there are many advantages in having the two bands coming through between the legs to be fastened in front. The St. Andrew's Cross is a very suitable bandage for this purpose, and is made as follows: A 3-inch bandage is used and is fixed by a turn or two



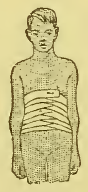
T-bandage (diagrammatic).



St. Andrew's Cross.

around the lower part of the abdomen from right to left. It is next carried diagonally downwards across the left groin and round the left thigh, and is brought up in front between the thighs and over the right groin to the right side of the abdomen. It is then carried round the back to the left side of the abdomen, across the front diagonally over the right groin, round the right thigh and up between the thighs over the left groin, and round the back to the original starting-place. Similar crossing turns are made till the required support is achieved, and the bandage is finished off by a turn or two around the abdomen, and the end is pinned.

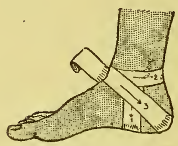
To Bandage the Abdomen.—This may be done by using an ordinary 4-inch roller bandage, but the many-tailed bandage is easier to apply, especially if it is not desired to disturb the patient to any great extent. The bandage is slipped underneath the patient and the lowest strip on each side is folded over in position. The next strip is then folded in position and by its overlapping the lower one it secures it in position. This process is repeated, each strip keeping the lower one in position, till, finally, the uppermost strip of all is reached. This requires to be held in position by means of a safety-pin.



Many tailed bandage.

To Bandage the Toes.—The toes may be bandaged in the same way as the fingers, beginning with a fixing turn or two round the ankle and making a long spiral down to the tip of the toe to be bandaged, then proceeding as was shown for the fingers. The great toe may be bandaged by a series of figure-of-eight loops round the toe and ankle, but this is rather a cumbersome method owing to the want of space between the toes. It will be found easier to treat the great toe in the same manner as the others, as explained above.

To Bandage the Foot.—This may be done so as to include the heel or as to leave it uncovered, according to the requirements of the special case. To exclude the heel, using a $2\frac{1}{2}$-inch bandage, commence by placing the end of the bandage beneath the sole of the foot at the root of the great toe. Bring the bandage across the top of the foot diagonally to the outer side of the ankle, round it to the inner side, and across the top of the foot to the root of the little toe, then beneath the roots of the toes to the starting-point. Proceed now to bandage up the foot by means of



Including heel.

Excluding heel.

spiral turns, and as the instep is reached, it will be found necessary to employ reverses. When reaching the ankle, finish off the bandage by making two or three figure-of-eight turns round the ankle and foot, and finish off by pinning the end.

The best method of including the heel is to begin by placing the end of the bandage on the inner side of the ankle, then carry it downwards across the sole at the heel and up across the foot beneath the ankle on the outer side; then round the front of the ankle and over the free end at the starting-place. This fixes the bandage, which is now carried round behind the ankle to the top of the foot in front of the ankle-joint. Carry the bandage down over the ankle on the inner side, over the tip of the heel, and up over the ankle on the outer side, then proceed with similar turns on either side of this central one over the heel, covering the foot from the ankle to the toes, and the lower part of the leg upwards from the ankle. These figure-of-eight turns are then finished off by a turn or two round the leg, and the end secured by a pin.

To Bandage the Leg.—Like the forearm (*q.v.*) the leg is cylindrical in its lower part, and then becomes conical as the calf is reached. Using a $2\frac{1}{2}$-inch bandage, begin by fixing it with a figure-of-eight turn round the foot and ankle, then proceed up the leg with simple spirals till reverses are found to be necessary. Finish off below the knee by a couple of spiral turns, and pin the end. In cases with very large calves, a few figure-of-eight turns may be necessary at the thickest part in order to get the bandage to fit neatly.

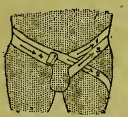
To Bandage the Knee.—A bandage which will be found most useful for the knee, inasmuch as it permits of freedom in walking, is what is known as the divergent spica. Use a $2\frac{1}{2}$-inch bandage, commence on the inner side of the knee, and make a turn completely round the knee, passing over the knee-cap, the knee being slightly bent. This turn fixes the bandage, and the next is made round the joint in a similar manner but slightly below the former, so as to overlap it in its lower half. The third turn goes round the knee as before, but slightly above the first, so as to overlap it in its upper half. The next turn overlaps the lower two-thirds of the lowest turn, and the next overlaps the upper two-thirds of the highest.

Divergent spica.

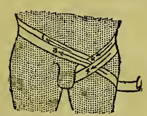
By continuing in this way the knee is completely covered, and the bandage is finished off by a couple of turns round the upper part of the leg, and the end is pinned.

To Bandage the Thigh.—The thigh is cone-shaped practically in all its length, and is bandaged simply by means of reversed spirals. The bandage should be finished off by means of a couple of turns round the lower part of the body, and a safety-pin inserted to secure the uppermost turns.

To Bandage the Groin.—Two forms of bandage are commonly used to bandage the groin, either to retain a dressing in position or to fix a temporary pad in cases of rupture. One is an ascending spica and the other a descending spica. Use a 2½-inch roller and begin on the front of the abdomen above the groin to be bandaged. Carry the bandage right round the body on the haunch bones to cover the free end in front, and then down across the thigh to its outer side, round the thigh, and up between the legs, crossing the front of the thigh



Ascending spica.



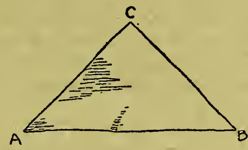
Descending spica.

over the groin on the same side, and then round the body back to the starting-place in front. Repeat these figure-of-eight turns round the body and the thigh till sufficient of the groin is covered in, and finish off with a couple of turns round the body. The descending spica is similar in method, but the bandage passes between the legs from the front instead of from the back. Starting as before, from the side of the injured groin, the bandage passes over the front of the body to the opposite side, round the haunch bones and the back, to pass over the free end in front. It now dips down over the groin between the legs, passes behind the thigh, and comes up on the outer side of the groin and passes over the front of the body as did the first turn. This is repeated, as before, till the necessary amount of the groin is included in the bandage, which is finished off by a turn or two round the body, and the end pinned.

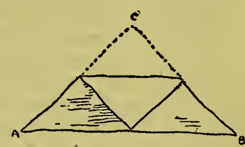
THE TRIANGULAR BANDAGE

The triangular bandage or handkerchief is of the greatest use in ambulance or first-aid work, but is also of great importance in cases where from motives of economy or for other reasons a supply of the ordinary roller bandages is not available. The simplicity of this bandage, and the ease with which it can be adapted to its many uses, render it of paramount importance in first-aid work. Though originally used chiefly as a sling in combination with roller bandages and splints, for which purpose it is still largely used, it may, in cases of emergency, be used instead of a roller bandage to retain dressings, to fix splints in position, and to support injured parts, while in addition, it makes an admirable emergency tourniquet to arrest hæmorrhage. It also has the advantages that it can be speedily applied and is capable of application to any part of the body.

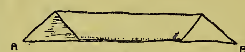
To make a triangular bandage, take a square of unbleached calico or strong linen, the side of which may be anything from 36 to 48 inches in length, and divide this diagonally into two equal triangles. The right angle C is known as the apex, and the line AB as the base. The lines CA and CB are known as the sides. We now have the triangular bandage in its simplest form. There are, however, two modifications which are in constant use—the broad and the narrow bandages.



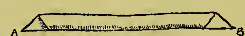
The Broad Bandage.—This is made by folding over the apex C so that it lies at the middle point of the base AB. A second fold is then made so as to bring the two parallel edges so formed into apposition, and the broad bandage or small arm sling is completed.



The Narrow Bandage.—This is made by beginning as above, and forming a broad bandage. A further fold is now made so as to reduce the width to one-half of what it last was. The uses of these two will be described in a later section.

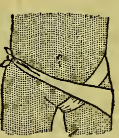


Broad.



Narrow.

A triangular bandage can, of course, be made to any size required. A useful size is often obtained by dividing the bandage given above into two by a line from the apex to the middle of the base. This size is often suitable in cases of children. The ends of the bandage may be pinned or tied in a knot. When a pin is used in any bandage, care must be exercised to secure that there is no weight or strain on the pin. All bandages should be tied by means of a surgeon's or reef knot.



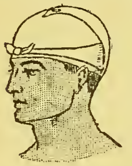
Groin: triangular bandage.

To Tie a Reef Knot.—Holding an end of the bandage in either hand, pass the left end in front of the right, and twist one end around the other in the usual way of making a knot. Now pass the left hand behind the right, and finish the knot. This gives a knot which is not liable to slip and has a very neat appearance, as the free ends lie along the line of the knot.

The Large Arm Sling.—Lay the bandage on the patient's chest so that the apex lies beneath the injured arm and extends well beyond the elbow. The upper end passes over the sound shoulder so as to pass round the back of the neck to the injured shoulder. The injured arm is brought to lie on the bandage on the chest so that the forearm makes a right angle with the upper arm at the level of the apex. The lower end of the bandage is now folded up over the forearm and carried up to the shoulder on the injured side, where the two ends are tied. Care is taken when tying the ends to see that the arm is properly supported. The apex is now pulled round to the front over the elbow, and is pinned to the bandage in front.

The Small Arm Sling.—Proceed as above, having previously made a broad bandage. The upper end passes round the back of the neck, the sling is applied so as to support the wrist and hand, with the forearm at a right angle with the upper arm, and the lower end is turned up and fastened to the upper end on the injured side of the neck.

Applied to the Head.—Turn up a fold of 2 inches along the base of the bandage, and place it on the forehead above the eyebrows. Get the centre of the base just above the nose. Throw the apex of the bandage back over the head so as to cover it and fall down behind. Then pass the ends round the sides of the head, just above the ears, to cross in the mid-line behind and round again to meet in the front of the forehead, where they are tied. Pull the apex down so that the bandage lies tightly on the scalp and turn the free end up over the band on to the scalp, where it is fastened with a safety-pin.



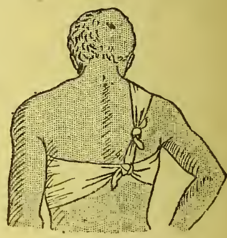
To Securea Dressing on the Forehead.—Place the centre of the narrow bandage over the dressing and pass the bandage around the head, above the ears, to the back of the head, where it is pinned or tied.

To Secure a Dressing to the Ears or beneath the Lower Jaw.—Place the centre of the narrow bandage below the chin as far back as possible; carry the ends of the bandage up over the ears, well on to the crown of the head, where they are pinned or tied.

To Bandage an Eye.—Place the centre of the narrow bandage over the eye obliquely, so that one end passes below the ear on the same side, and the other end above the ear on the opposite side. Tie or pin the ends at the back of the head.

To Bandage the Shoulder.—For this we require two triangular bandages, and the method of applying them varies according as we want to support the arm on the injured side or allow it to remain free. Fold a hem of 2 to 3 inches at the base of one bandage, and lay it on the shoulder with the base half-way down the upper arm and the apex pointing up along the neck. Secure the ends by passing them round the arm once or twice, and tie or pin them. A second bandage, folded into a broad bandage, is placed with its centre over the apex of the first, over the injured shoulder; the ends are passed round the body and tied beneath the armpit on the opposite side. The apex is now pulled up so that the bandage covers the shoulder closely. It is then turned over the broad bandage and pinned in position. This allows the injured arm to hang freely and be used; in cases where it is desired to rest the joint, the second bandage is applied as a sling. One end of the broad bandage is placed on the apex. The forearm and wrist are supported in the sling made by turning up the other end and bringing it over the sound shoulder and across the back of the neck, where the two ends are tied.

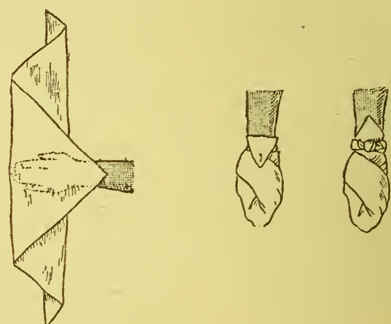
To Bandage the Chest.—Standing behind the patient, draw the apex over the shoulder, letting the bandage lie on the chest in front. The two ends are passed round the chest underneath the arms and tied in a knot. The apex is now brought down on the back and tied to one of the free ends of the knot.



To Bandage the Back.—This is done exactly in the same manner as the above, except that the bandage is placed on the back with the patient facing the attendant. These two bandages are especially useful in cases where fomentations or poultices require to be repeated at short intervals.

To Bandage the Elbow.—Fold a hem of 2 to 3 inches at the base of the bandage, and place it with its mid-point on the back of the forearm a handbreadth below the elbow-joint. Place the apex along the back of the upper arm towards the shoulder. Bring the ends forward over the forearm, cross them in front of the elbow-joint, carry them round the upper arm thus forming a figure-of-eight, and tie them on the outer aspect. Pull the apex up so that the bandage lies closely along the elbow, turn it down over the knot, and pin it to the bandage.

To Bandage the Hand.—Fold a hem of 2 inches along the base of the bandage, and lay it out on a table. Place the hand on the bandage with the wrist on the hem and the fingers towards the



apex. Fold the apex back over the fingers and hand to lie along the back of the forearm, and bring the ends twice round the wrist to be tied on the back. Pull the apex tight, fold it over the knot, and pin it to the bandage.

To Bandage the Hip.—As in the case of the shoulder, we require two bandages. Tie a narrow bandage round the body well above the buttocks, having the knot on the injured side. Fold a hem of 2 inches along the base of the second bandage, which is placed on the buttock with the apex upwards. Bring the ends round the thigh and tie them on its outer side. Pull the apex up underneath the narrow bandage, turn it down over the knot, and pin it to the bandage.

To Bandage the Knee.—Fold a hem of 2 inches along the base of the bandage. Place it on the knee with the apex pointing upwards and the base a handbreadth below the joint. Bring the ends back over the leg, cross them behind the knee-joint, carry them round the thigh a handbreadth above the joint, forming a figure-of-eight as in the case of the elbow, and tie them on the outer aspect. Pull the apex up so that the bandage lies closely along the joint, fold it over the knot, and pin it to the bandage.

To Bandage the Foot.—Fold a hem of 2 inches (see above) along the base of the bandage, and lay it on the floor. Place the foot in the centre of the bandage with the toes pointing towards the apex. Fold the apex over the foot and carry it up to the front of the ankle. Bring the two ends round the ankle to cross in front, and then round the foot, crossing at the instep, to be tied on the front of the foot. Bring the apex down over the ends and pin to the bandage.

The Narrow Bandage may be used in all cases of wounds on the arms or legs, or to retain a dressing in any situation. It may be used to arrest hæmorrhage from a wound by placing it with its centre on the wound, and bringing the ends round the limb to be tied in such a way that the knot lies on the wound and exerts pressure on it. It may be used as a tourniquet to control bleeding from a wound by pressure on the main blood supply to the part. The details of this will be found under the control of hæmorrhage.

Bandaging.—From the descriptions above given of the methods of use of the two main kinds of bandages, it will be readily seen that, whereas the roller bandage is capable of more exact adaptation to any particular part, it requires considerably more skill in its application than does the triangular bandage. The latter is, above all else, the bandage for first-aid work. To begin with, it can easily be improvised out of any suitable material which comes to hand, much more so than can a roller bandage. The rapidity with which it can be applied is second in importance only to the rapidity and ease with which it can be removed, so that the medical man, who has been sent for, and the time before whose arrival has been so well spent by the intelligent dispenser of first aid, need lose very little time in getting access to the seat of injury. While this is so, we would, however, impress very strongly on everyone the importance of acquiring proficiency in the use of the roller bandage by carrying out the instructions given above. In most carefully-managed households a supply of first-aid necessaries is kept, only to be rendered useless in time of need owing to the inability of any of those at hand to make use of them. The minor injuries of children can very well be attended to, without the intervention of a medical man, by a person who has taken the trouble to master the principles of first-aid work, and the moral effect on a child of a neatly and securely-dressed injury is almost as important as the physical.

EMERGENCY APPLIANCES

People are often unable to perform certain functions for one or perhaps both of two reasons. It may be that the person has all the necessary knowledge but has not the necessary means at hand to enable that knowledge to be of use. Equally useless is the state of the person who, with all the necessary appliances at hand, possesses no knowledge as to how they should be used. The person who has neither the knowledge nor the appliances is equally useless, and, though having more cause for regret than either of the other two, probably actually has less. No one can be expected to wander through life with a fully equipped set of first-aid apparatus cleverly concealed in some capacious pocket, ready for use on the slightest opportunity, but nowadays it is surely not too much to expect everyone to carry in his or her head the knowledge of what should be done in any given case. It is with the object of supplying this knowledge that this section is written.

While no doubt it may be of use when appealed to suddenly, when the accident has happened, in order to find out what should be done, much valuable time will be saved and infinitely greater help will be given by a person who has taken the trouble, in his spare moments, of acquiring that knowledge, the principal point of which is the benefits it enables its possessor to give on the spur of the moment. In the case of an accident the injured person is lucky if such a person is at hand, and that person is again fortunate if the necessary appliances are to be readily found ; if they are not, then his ingenuity must set to work to fashion such articles as he needs out of the materials at his disposal. The most unlikely articles have before now been put to the most ingenious uses in cases of accidents in out-of-the-way places. While different considerations arise in different cases such as can only be tackled on the spot, there are certain hints which may be given in the hope that they may prove as useful in the future as they have done in the past, and that to a wider circle. The hints which follow as to the uses to which certain articles may be put are valuable, not only in themselves, but also in showing the lines along which a person's ingenuity may wander in the search after some new idea of practical value either to himself or to others.

Bandages.—Bandages may be improvised from a piece of old clean linen, a sheet being very useful for this purpose, as it is of a fair length. More scope exists, however, in improvising triangular bandages. Practically any material may be employed, a large handkerchief being one of the most obvious resources. Suppose a sling is wanted and there is no material at hand of sufficient size to meet the demands. Take one of the largest handkerchiefs available, divide this into two triangles, and fold one into a narrow and the other into a broad bandage. Tie the narrow bandage loosely round the neck, and support the injured arm in a sling made of the other, the ends of which are tied round the loop formed round the neck. This will be found to give a sling of the necessary length.

A very simple sling is obtained by buttoning up the coat and passing the hand well inside, while a few safety-pins may be used with even greater effect to fasten the arm of the coat to the coat itself or the sleeve of the shirt to the front of it.

Two handkerchiefs used as a sling.

Coat used as sling

The tail of the coat may be turned up over the injured arm, and securely fastened to the front. A practical point to remember in all such cases is to see that the coat is buttoned, else it will tend to fall away to the side on which the weight acts.

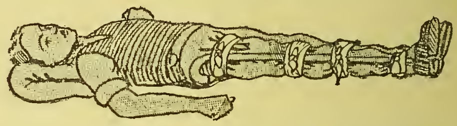
Splints.—It is when we come to the question of splints that full scope can be given to the ingenuity. A splint is anything which is used to keep an injured part of the body at rest, both for the purpose of giving relief to the patient, and of preventing any further damage to the injured part. When we come to the study of fractures it will be seen how very important this latter point is. The most serious consequences may arise from moving a patient with a fractured limb for which nothing has been done, while, once a suitable splint has been applied, the patient can be moved with absolute security. There are three main requisites to be desired in any splint:

1. The splint should be firm so as to support the limb.
2. It should be long enough to enable the joints, both above and below the fractured bone, to be kept at rest.
3. It should be padded so as to fit the limb, and have no hard surface in contact with it.

The first two are easily attainable: the last may be largely secured by making use of articles of clothing and by applying the splint over the patient's own clothes.

While it is the case that there is a special splint devised for every fracture which can possibly occur, these splints are altogether outside the province of first-aid work. Their use is as part of the treatment of the case, whereas the object of a first-aid splint is to render the patient less uncomfortable, and minimise the risk of further injury before proper medical treatment is secured. A list of the possible articles which may be employed for this purpose would be well nigh endless, and would include many obvious as well as many less likely articles. The important thing is to make use of what is at hand.

A piece of wood may be found, than which nothing, of course, could be better; but a walking-stick or umbrella may be pressed into service. A piece of pasteboard may be doubled up on itself,



SPLINT.—Walking-stick on leg, with legs tied together.

so as to give good support, or a newspaper or two rolled tightly up. The straw coverings of bottles make splendid splints. If nothing else is available a coat may be used, being formed into a roll lengthwise.

Failing any such adventitious aid, a fractured arm may be tied to the side of the body so as to prevent any movement of the arm as a whole or in part, and even though some splint has been applied to a broken leg it is always advisable to bandage the two legs together, making thus an additional splint of the uninjured limb. If a supply of triangular bandages is at hand, they form the best means of securing the splints in position. Each should be folded to form either the broad or the narrow bandage, the latter being usually found more suitable. Certain points should be observed, which not only add to the patient's comfort, but render the apparatus more effective and easier of removal.

All bandages should be firmly and securely applied, but care must be taken that they are not tied so tightly as to interfere with the circulation in the limb beyond the point of application. The narrow bandage should be doubled in two and passed round the limb and the splint so that the fold lies over the splint. Pass one of the ends through the loop formed by the fold, and tie it to the other over the splint by means of a reef knot. In this way the knots are prevented by the intervening splint from pressing on the limb and so causing pain to the patient. It is always easy to pass a bandage round the arm, as it hangs freely by the side of the body: in the case of a broken leg, however, the patient is lying on the ground, and any movement of the leg or indeed of the patient is to be avoided. Never attempt to apply a bandage to a broken leg by lifting up the leg to get the bandage underneath. Pass a piece of flat wood or a stick between the folded sides of the bandage, and by this means gently push the bandage underneath the limb and withdraw the stick.

It will be found that there is less risk of moving the limb if the uppermost end of the splint is secured first. Movement is always more likely to occur in the lower part, more especially so if it has a splint attached to it and not to the upper part.

Make the splint as far as possible of suitable size for the injured limb, and if there is any doubt as to the size, all measurements should be made on the uninjured limb. Be especially careful never to apply a bandage over the seat of the fracture. Not only would this cause greater pain to the patient, it might cause serious harm. The ends of the splint should be tied first, the upper end always before the lower, and next bandages may be applied on either side of the seat of fracture. This secures that not only are the fractured portions kept at rest, but also the joints on either side if the splint is, as it always should be, of sufficient length to cover the joints on either side.

If triangular bandages are not at hand, there are many things which may be used to secure the splints in position. A supply of handkerchiefs is usually forthcoming from the crowd of spectators which an accident attracts, and suit the purposes admirably. Less likely articles may, however, be pressed into service, such as belts, neckties, or pieces of linen or cloth of any kind torn up as desired.

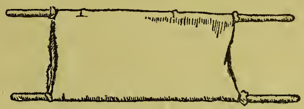
Stretchers.—In all cases of fracture of the legs, spine, or skull, the patient should not be moved in an upright position, and a stretcher should always be employed. Here, again, use must be made of what is at hand. A shutter, door, ladder, or gate makes an excellent stretcher, if available. It should always be made as comfortable as possible for the patient by covering it with rugs, blankets, straw, &c. The head should always be supported by means of a raised pillow of some kind or other. It is sufficiently uncomfortable for a perfectly sound person to lie on his back with his head at no higher level than his body to show how much it would add to the discomfort of an injured person were this simple precaution not attended to. In the case of a door or gate being used, care should be taken to prevent any rolling motion of the patient from side to side by padding the rug or blanket well along his sides. In many cases it may be found necessary to tie the patient down to the stretcher. Such tying, however, must always be done in such a way that it can be easily and quickly undone.

Useful emergency stretchers may be made in one or other of the following ways. Two long poles are obtained; they should be considerably longer than the length of the patient, if possible, but we may often have to manage with poles of lesser length (for instance, two rifles may be used). The two poles are laid on the ground, and a strong rope is tied to the end of one of them. It is brought straight across to the other and tied round it, then back to the first at a short distance from the original knot and tied there. The process is repeated from one pole to the other till the ends are reached, when the rope is again securely tied.

Or, the same poles being requisitioned as before, take two coats, turn the sleeves outside in, and

STRETCHER.—Poles and two coats.

fasten each so that the sleeves now hang down the inside. Pass the poles through the sleeves of each coat, the bottoms of the coats meeting one another in the middle. Here they should be pinned together to prevent their slipping apart. The stretcher should be turned so that the patient lies on the backs of the coats. A sack may be used by cutting



STRETCHER.—Poles and sack.

two holes at the bottom corners and passing the poles inside the sack and through these holes. The corners of the sack should be tied to the poles by stout pieces of cord.

Other methods, according to the appliances which are at hand, may suggest themselves, but in no case should it be attempted to carry an injured person on a stretcher of any kind, without first testing it on a sound person. This point is apt to be overlooked, especially when there is cause for losing as little time as possible, but it is wiser to lose a few minutes at the start in order to make sure of the apparatus than to run the risk of a much greater loss of time and possible serious injury to the patient should the stretcher fail to fulfil the requirements.

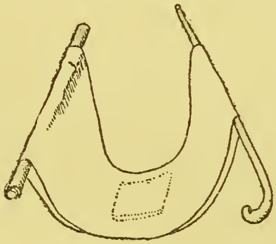
A chair stretcher may be used to carry a patient who, while quite conscious, is unable to walk, and has to be taken a considerable distance. Two poles are tied to the legs beneath the seat of a common wooden chair. The patient should always be tied to the back of the chair by a couple of triangular bandages to prevent any risk of his falling off.

Fomentation or Compress.—A fomentation is a method of applying moist heat to an injured part to relieve the pain by what is known as counter-irritation. The tissues with which the fomentation is in contact are warmed and relaxed, and the pain and tension in them consequently reduced, while in addition, owing to the effect on the circulation locally, the deeper tissues are also benefited. The same purposes are secured by poulticing the part: the pain is relieved and the inflammation is reduced in the same way, but a fomentation has several advantages. It is much lighter, and is more comfortable to the patient; it is ever so much more cleanly than a linseed poultice, and requires much less skill in its preparation. The only disadvantage as compared with a poultice is that it does not retain its heat for as long a time, and so needs to be renewed with greater frequency. As has been said, it is easy of preparation, but at the same time it must be properly made or its efficacy is diminished if not altogether counter-balanced by its evil results. If the proper action is to be secured the fomentation must be quite dry when it is applied to the skin, otherwise there is a decided risk of the skin being scalded, with much discomfort and added pain to the patient.

The simplest fomentation consists merely of a piece of flannel wrung out of boiling water. This seems a very simple matter, and such it is; but two things are necessary to ensure its being properly made. The water must be boiling, and the water must be sufficiently wrung out of the cloth to leave it quite dry. The method which should be adopted of doing this is an easy one. Take a piece of flannel, a bit of an old blanket will serve admirably, twice the size of the area to be covered. Fold it in two, thus giving a double layer of cloth of the required size. Place this on the centre of an ordinary towel or piece of sacking about the size of a hard towel. This is then laid on a large deep basin or tin into which the towel and flannel are allowed to hang. Boiling water is now poured over the flannel into the basin till it is quite covered, and is allowed to soak for a few

Twisting fomentation in towel.

minutes. The sides of the towel are then folded over the flannel and the ends seized, one in each hand or each end in the hands of different persons. By twisting the ends in opposite directions the water is wrung out of the flannel, and it is on the completeness of this wringing out that the success of the fomentation depends. When all the water has been wrung out the towel is unrolled and the fomentation is ready for use. It should be wrapped up in a dry towel and taken immediately to the patient to the affected part of whom it is to be applied. If the fomentation has to be prepared by one person without any asistance it will be



FOMENTATION.—Roller towel and sticks before twisting.

found easier to make use of wringing sticks. For this purpose a roller towel is used, and the two sticks are passed through the ends of the towel. Any kind of a strong stick will do—rulers or walking-sticks may be used. The flannel is soaked as before, and the wringing is performed by twisting the sticks in opposite directions, till no more water can be squeezed from the fomentation. If the fomentations require to be renewed frequently it is a good plan to provide two pieces of flannel, each of which is double the size required, and sew the ends firmly together so that the roller towel may be dispensed with and the sticks inserted into the ends of the flannel itself.

To apply the fomentation it should be smoothed out quickly and laid flat on the affected part. It should be covered with a piece of oiled silk or macintosh, or some waterproof material large enough to overlap it on all sides. Over this some cotton wool, tow, or old flannel should be placed, and the whole kept in position by means of a triangular or some turns of a roller bandage. A fomentation will probably be found to have cooled in little over an hour, and should then be removed and another substituted. A fomentation should cause no pain or discomfort, rather should it add to the comfort and well-being of the patient. Care must be taken that the skin is not scalded, in which case a soothing application must be applied. If there is any wound or abrasion of the surface, flannel should not be used: if a fomentation is necessary in such a case an antiseptic substance, such as boracic lint, should be used.

Substances may be added to the fomentation to add to its efficacy. The commonest of these are turpentine and laudanum. The former is of the nature of a counter-irritant, and is used for deep-seated affections such as lumbago; the latter is sedative and helps to allay the pain locally.

A turpentine stupe is made by sprinkling about half an ounce of turpentine over the flannel before pouring on the boiling water, which thus mixes with the turpentine and ensures its being evenly distributed over the cloth. This stupe is more liable to cause blistering than a simple one, and should not be applied when the skin is very red and inflamed.

A sedative fomentation, useful for relieving gripes or colic, is made by sprinkling half an ounce of laudanum on the flannel before pouring on the boiling water. If no laudanum is available a poppy fomentation may be made by crushing up two or three poppy heads and boiling them for a quarter of an hour in a quart or so of water. This is strained, brought again to the boil, and poured over the flannel as shown. It has a sedative effect similar to the laudanum preparation.

Poultices.—Since the introduction of antiseptic surgery, poultices are not much used in surgical work where there is a wound of the skin, as they may serve only too well as an encouraging medium for the growth of micro-organisms. In medical cases, however, they are frequently used to allay inflammation of the deeper parts beneath the surface to which they are applied. The commonest form is the simple linseed poultice. In making this the crushed seed should be used rather than the meal, as the former contains a larger amount of the natural oil of the seed, which gives the poultice a better surface, and makes it less likely to adhere to the skin. If the crushed seed is not obtainable and the meal has to be used a little olive oil should be added, as the water is being poured on. See page 651 for method of preparation.

A mustard poultice (described on p. 652) will probably be found to produce the desired smarting and redness of the skin in less than an hour, when it should be removed and the reddened skin covered with vaseline or oil and lint or cotton wool. It will be found useful in cases of chest affections, in severe vomiting, and in collapse from severe injury or poisoning.

In case there is no oiled silk or macintosh available an efficient substitute may be found in a piece of glazed or butter paper which will prevent the passage of moisture. This, of course, may also be used with fomentations.

Blisters.—Blisters are used to produce an active counter-irritation over a localised area, such as a swollen knee-joint, or over the sciatic nerve in cases of sciatica. A doctor may order a blister to be applied in a certain position and leave the carrying out of his instruction to a member of the patient's family. It should always be ascertained of the doctor the exact size of the blister he desires to have applied. If the part is covered with hairs, these should be shaved off over the site of application, and the skin should be washed with a strong soap. A piece of cantharides or fly blister is cut to the required size, and small cuts are made into it along the edges. The blister is warmed before the fire till the surface appears shiny, when it is applied to the affected part, covered with cotton wool or clean linen and bandaged lightly on. The cantharides is soluble in oil, so it is found that a fly blister will act more readily if the part is lubricated with olive oil before the blister is applied. The presence of the oil also makes it easier to remove the blister when the bleb has formed. When this has occurred the blister is removed and a small cut is made in the lowest part of the bleb, with clean scissors which have been dipped in an antiseptic solution, and a piece of boracic lint or clean linen placed over it. This should be covered with cotton wool and secured in position by means of a bandage.

If blistering fluid is at hand it may be used. Cut a hole in a piece of paper the size of the area to be blistered, and lay the paper on the part with the hole in the required position. Then with a camel-hair brush paint on the fluid. The paper will limit the fluid to the area desired. The bleb or blebs which ensue should be treated as before.

Ice-bags.—An ice-bag is made of india-rubber or macintosh substance which will not allow the melted ice to escape. It is used in cases of injury to the head, and in certain inflammatory conditions of the abdomen. A block of ice is broken up into chips by means of a sharp and strong hat-pin; the chips are placed in the bag, which is then securely fastened. An ice-bag may be improvised by using a sponge-bag which has no holes or tears in it, a piece of an old inner bicycle tyre, or a lady's rubber bathing cap. Care must be taken to see that the bag is securely tied. In the absence of ice or a bag suitable to contain it, the cold may be applied by means of flannel cloths wrung out of cold water and vinegar, which are applied to the affected parts.

Crutches.—Crutches may be improvised for use by a person who has sustained an injury to a lower limb by using two ordinary brooms, the handles of which are cut to the required length. The hairs should not be removed but well covered over with layers of soft material, such as flannel, so as to present a soft yielding surface to the armpits. The length of the crutch should be such that it is in vertical position when in use; it should not be inclined away from the body, as is necessary if it is too long. If any numbness or discomfort is experienced in the arm, a portion of the handle should be removed and more padding added to the head.

HOW TO REMOVE AN INJURED PERSON

In cases of accidents in towns necessitating the removal of the patient to a hospital, an ambulance can always be procured, fitted with all the necessary appliances in the way of stretchers, blankets, &c. A person, however, may meet with an accident or become ill in a place where no such convenience is at hand, and it may be necessary for those on the spot to convey him to his own home or to an institution where treatment is available. There are several methods of transporting an injured person, of which a description will be given: the adoption of a particular method in each case depends on the nature of the injury, on the number of assistants, as well as on the appliances available.

Taking these requirements into consideration, we find that the methods of transport fall into four groups, each of which will be described, and the easiest and most suitable means of carrying it out will be indicated. An injured person, then, may be removed by

1. Support from one assistant.
2. Being carried by one, two, or more assistants.
3. Stretcher with two, three, or more assistants.
4. Ambulance or any improvised conveyance.

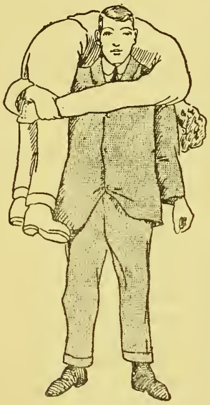
In cases where the patient is able to walk, the injury not being of such a nature as to incapacitate him, the person who renders first aid will also be able to conduct the patient without any other assistance.

To Support a Patient.—Take up a position beside the patient, on the uninjured side in cases where the injury is on one side of the body, for example, any injury to the arm. Place one arm round the patient's waist so as to get a secure grip. Get the patient to pass his arm behind the bearer's neck and allow his hand to hang forwards over the far shoulder. Here the hand is grasped by the free hand of the bearer, who is thus enabled to support the patient without any great discomfort to either. By tilting the body slightly away from the patient part of his weight can be borne by the bearer, and the patient less readily tired by the journey. It will be found on attempting to help a patient in this way that there is a tendency for the patient to slip rather too far forward, away from the bearer and so overbalancing; consequently it is necessary to keep a firm grip, and if anything hold the patient in a slightly backward sloping position.

To Carry a Patient—One Bearer.—The patient, however, while conscious, may be unable to walk, owing to weakness or exhaustion. If more helpers than one are available, the carriage is a matter of no difficulty, but one person may find himself alone with a patient in such a condition. The bearer may be able to carry the person in his arms or on his back, the latter being the less exhausting of the two, but if the patient be a heavy person the progress will be slow and arduous, and frequent stoppages for rest may be needed. It is better in such a case to get further help. Whether the patient is carried in the arms or on the back, he should always steady himself by putting his arms round the bearer's neck. Not only does this steady the patient and give him greater comfort, it adds considerably to the comfort of the bearer, and renders the work of carrying much more easy.

It will be found more difficult to lift an average person on to the back than to take him into the arms. The former may be most easily done by the bearer stooping down in front of the patient, who is propped up in a sitting position, with the back towards him, and, pulling his arms up over the shoulders, gradually bending further forward till the patient is firmly astride his back. The patient's hands are then clasped round the bearer's neck, the latter's hands being free to pass round the patient's thighs and hold him in position by a firm grasp at the back.

Still more difficult is the case of the bearer when left alone with an unconscious person who requires to be removed. Still, if the bearer sets about it in the right way, the difficulty can be overcome. Do not attempt to lift an unconscious person in the arms as a child might be lifted. The dead-weight of an unconscious person renders it extremely unlikely that such an attempt will be successful. The best method in such a case is that employed by firemen in rescuing persons overcome by fumes. The patient is laid on his face, with his arms lying close to his sides. The fireman stands at the head of the patient and raises him by the shoulders, so that he kneels against the left leg of the fireman, who next lifts him into the standing position by passing his arms round the body beneath the shoulders. The fireman now stoops down so that the patient's body falls over his shoulders, the left one being against the patient's stomach, and catching hold of the left hand, pulls the left arm across his back and down over his right shoulder. He next slips his left arm round the patient's left leg, and raises him from the ground by standing up straight. The body is now lying across the fireman's shoulders and is securely fixed in that position by grasping the patient's left arm, which is hanging down in front, in the fireman's left hand, which has already passed round the patient's left leg.


Fireman's lift.

This gives a firm and secure grip and enables the fireman to carry his patients even up and down ladders, the right hand being free to grasp the ladder. It will be found that no easier method than this can be devised, and with a little practice in the manner indicated anyone can attain a considerable degree of proficiency.

Two Bearers.—It will be found comparatively easy for two persons to lift and remove an injured or unconscious person, and the distance which he may be carried with comfort is much greater than when there is only one person to help. There are here four methods of transport, each of which is specially useful in certain cases. The first two are used in cases where, owing to the patient being unconscious or having his arms or head injured, he is unable to give the bearers any assistance, whereas the latter two require the patient to help by putting his arms round the bearers' necks. The four methods are known as

1. The fore-and-aft method.
2. The two-handed method.
3. The three-handed method.
4. The four-handed method.

The Fore-and-aft Method.—The patient lies on his back and the bearers stand one at his head and one at his feet. The patient is raised to a sitting position, and the bearer at the head passes his arms round the body below the arms and clasps his hands on the chest. The other passes with his back to the first, steps between the patient's legs and grasps them at the knees. The patient is then raised and is carried in a sitting position, with his back against the chest of the first bearer. The bearers must take short steps, and should always be out of step with one another. The method may be employed where the patient has to be carried along a narrow path which is only wide enough to allow one person to pass along at a time.

The Two-handed Method.—The bearers stand one on either side of the patient, who lies on his back, and facing one another. Each stoops down and passes an arm behind the patient's back, taking hold of a portion of his coat in each hand well to the opposite side. The coat should be buttoned in front beforehand. The patient is then raised to a sitting posture, and the other hands are passed below his thighs and clasped together. The bearers then rise and march off, the bearer on the right beginning with the right foot, the bearer on the left with the left. Instead of grasping the patient's coat, the bearers may grasp each other's shoulders.


Two-handed seat.

There are one or two points which may be observed in clasping the hands beneath the thighs which add to the comfort of the bearers. Each bearer may grasp the wrist of the other or the fingers of the two hands may be dovetailed into one another so as to get a firm lock. A handkerchief may be employed in either of two ways. The fingers of the two hands may be bent on the palms, and a handkerchief folded in four used as a pad in each case. The two hands are then brought together so that the bent fingers lie against the palms of the other hands, the inner surfaces of the fingers being in contact, separated only by the handkerchiefs which act as padding and make the grip easier.

The Three-handed Method.—This method is used when the patient has an injury to a leg, which needs to be supported, and is able to use his arms. The two bearers stand facing one another behind the patient. If the patient's right leg is injured the bearer to the right keeps his right hand free to support the injured leg. The other bearer grasps his own right wrist with his left hand, the palms of both looking downwards. The right bearer grasps the left bearer's left wrist with his left hand, the wrist of which is in turn grasped by the left carrier's right hand. In this way a triangle is formed by the two left hands and one right hand. This forms the seat. The bearers now step forward

Three-handed seat.

and slip the seat so formed beneath the patient, who places his arms round their necks. The patient is next raised by the bearers standing upright, and the right bearer steadies his right leg with his right hand. The right bearer steps off with the right foot, the left bearer with the left.

The Four-handed Method.—This is an easier method for the bearer than the last, and is used also when the patient is conscious and able to use his arms. It is the most comfortable for the patient, and is less likely to tire the bearers than

Four-handed seat.

Four-handed seat.

the three-handed, as his weight is borne by their four arms instead of only three. The bearers face one another behind the patient, and each grasps his own left forearm with his right hand, the palms of the hands looking downwards as before. The right forearm of each bearer is then grasped by the left hand of the other, forming thus a square with the knuckles at each corner. This forms a seat. The bearers stoop down and slip the seat so formed beneath the patient, who sits on it and balances himself by putting his arms round the bearers' necks. The bearers rise up and march off, the right bearer beginning with the right foot, and the left bearer with the left.

In all cases where a stretcher is unnecessary two bearers, by adopting one of these methods, can carry the patient very successfully; but in cases where a stretcher is desirable but cannot be got, the patient may be removed by two bearers using the two-handed seat, while a third takes charge of the injured limb.

Stretchers.—Hints have been given as to how emergency stretchers may be improvised from the materials at hand: a few hints as to the best means of placing the patient on the stretcher and of carrying it will be of value. All unnecessary handling of the injured person is to be avoided, even though suitable splints have ben applied, and, above all things, should be done with all appearance of order and lack of undisciplined haste. Every ambulance corps has its regular stretcher drill, so that when called to an accident everything is done in proper order and in the most desirable way. As an indication of how a patient should be removed to a stretcher we cannot do better than give an outline of the usual "Stretcher Drill" which is practised. Even though it may not be possible to carry it out in detail in an emergency, valuable suggestions may be gained as to how best to proceed with appliances and number of helpers available.

If possible, four bearers are requisitioned, and the very first thing to be done is to see to it that all orders shall be given by one and by one alone. The importance of this is obvious to anyone. The patient is lying on the ground and the stretcher, of whatever nature it be, is placed at the right side of the patient and about a yard distant, lying parallel to the body. The first bearer stands at the patient's hips on his right side between him and the stretcher, the other three on the left side, one at the knees, one at the hips, and the third at the shoulders, all four facing the patient. On the word from the first bearer they all kneel down on the left knee and pass their hands underneath the patient. The hands of the bearer at the knees pass beneath the legs, keeping well apart so as to support them. The bearer at the shoulders passes his right hand beneath the patient's shoulders, and his left across his chest and beneath his right shoulder. The two bearers at the hips pass their hands beneath the hips and body and take hold of one another's hands. On the word being given, the patient is gently lifted and placed on the knees of the three bearers on the left side, while the first bearer lets go and brings the stretcher beneath the patient. He then resumes his original position on the other side of the stretcher, and gives the word to lower. This is done gently and the patient is placed on the stretcher. The bearers then rise and, the two at the centre of the stretcher remaining where they are, the others go, one to the head and the other to the foot of the stretcher. The stretcher is steadily lifted and the bearers move off, the foremost and the two at the sides beginning with their left feet, the one at the head with his right.

To remove the patient from the stretcher the process is carried out in the reverse manner. With three bearers the procedure may be similarly carried out. Two stand on the patient's left side and one on the right. The bearer supports the patient's legs and thighs, the other two his hips and shoulders, grasping one another's hands. The stretcher has previously been placed in the same line as the patient, and one end is close to his head. The bearers lift the patient up carefully and, taking short side steps, they walk up along the stretcher, two on the left side and one on the right, and lower the patient carefully and gradually. If only two bearers are available the stretcher should again be placed in the same line as the patient, and close to his head. The two bearers then stand over the patient with a leg on either side. The first bearer passes his arms beneath the shoulders and clasps his hands; the patient may clasp his hands round the bearer's neck. The second bearer passes one hand beneath the patient's thighs, and the other beneath the calves of his legs. The patient is slowly lifted just sufficient to clear the stretcher, and is gradually carried over it by the bearers taking short steps and bending forward in turn. The patient is then lowered on to the stretcher, and the bearers go one to the head and one to the feet.

Bearing these directions in mind, one person can readily see to it that an injured person is properly treated. When the necessary splints have been applied or while they are being applied a stretcher should have been improvised by some of the onlookers. The person who is giving first aid should select as many men as he wants to help him and explain to them exactly what he wants them to do, and make sure that they understand. As a rule, three people can deal with a case: if the patient has to be carried for a long distance, more may be chosen, to relieve the others at intervals. All must, however, take their orders from the "chief" and do what he directs them to do.

The patient should be made as comfortable as possible when on the stretcher. There are several points which should be remembered to secure this desirable end. An improvised stretcher must always have a good covering of blankets, rugs, clothes, or straw, and a pillow must be prepared for the head. See that the pillow is neither too high nor too small—it might as well be absent altogether—and it is very easily put at the proper height. When a lower limb is injured the patient should be well padded beneath the sound side, so as to keep the injured leg at rest. In the case of an arm injury, however, the patient should either lie flat on his back or be supported so that he lies on the sound side. When the abdomen is wounded the patient should lie on his back with the knees supported by a pillow of some kind, so as to release the muscles of the abdomen.

The two bearers carrying a stretcher must not keep step, as this imparts a rolling motion to the stretcher, like a ship at sea, and adds greatly to the patient's discomfort and exhaustion. The bearers should be as nearly the same height as possible, so that the stretcher is carried in a horizontal position. The horizontal should always be maintained, no matter how inclined the road may be. The low end should always be raised a little, and the higher end lowered. Never carry a patient on a stretcher on the bearers' shoulders.

It is advisable to have the patient always under observation, which this would render impossible, and, in case of any slipping or stumbling of the bearers, the consequences would be considerably more serious. The patient should always be carried with his feet first except in going up hill, when his head should be first, and in going down hill if the injury is to one or other of the lower limbs. The bearers should take short even steps, and should walk with the knees bent: this prevents any noticeable rising and falling of the stretcher as they walk. The route taken should be as far as possible over level ground. It may be advisable in certain cases to choose a longer path than is really necessary in order to avoid hills, or hedges, or ditches, &c.

It may be necessary to cross a ditch or a wall in the course of the journey. The greatest care must, of course, be exercised in such circumstances. The stretcher is lowered close to the ditch, and two of the bearers enter the ditch. They take hold of their end of the stretcher and support it while it is being moved across the ditch till the other end rests on the edge. The third bearer now descends, and the three carry the stretcher to the opposite side, where the foot rests on the edge of the ground till one of the bearers climbs up and again takes hold of it. It is now carried along till the head rests on the edge of the ground, when the other two bearers climb out and resume their original positions. They then raise the stretcher and proceed as before.

On coming to a wall the stretcher is raised till the foot rests on the wall, over which a bearer climbs while the other two support the head. The stretcher is carried forward till the head rests on the wall, when the other bearer climbs over and takes hold of the head. The stretcher is then lowered to the ground, and the bearers resume their original places. Exactly the same method is employed in placing a stretcher in an ambulance or on a wagon or cart which has to be used as such. An emergency ambulance may be provided out of an ordinary cart or wagon. The bottom should be well padded with straw and, if possible, have some rugs or blankets on the top; this is not only easier for the patient, but helps to minimise the jolting which is part and parcel of such a wagon's usual progress. The pace of the transit must be regulated by the state of the patient as well as by the necessity for quickly reaching the institution where treatment is available.

Preparations for Receiving an Accident Case.—It may be necessary to take the case to his own house, to which news of the accident should immediately be sent, with as much detail as to the nature and seriousness of the case as is possible. It is then necessary for those at home to be ready to receive the case on its arrival and have such arrangements as are necessary completed. For minor accidents there is not much to be done, but in the graver cases a suitable room should be chosen for the reception of the injured person. The room should be easily accessible and of comfortable dimensions. A bright, cheery, well-lit room is always to be preferred. If the patient's own room is at all suitable it should be chosen, as the patient will probably feel more at home there than in a strange room. A fire should be immediately lighted in the room. The passage to the room should be cleared so as to allow the easy progress of the stretcher, and if it is thought that a halt will be necessary two chairs should be placed to support the stretcher at the point where such halt is necessary.

The room should be cleared of all unnecessary furniture, and the bed so placed that both sides can be approached. If there be much to be done in the way of removing muddy clothes and applying dressings it is a good plan to have a temporary bed —a couch or low table—placed near the bed, on which the patient may lie till he is ready to be placed in his own bed. This may be covered with old sheets or even with newspapers.

Do not select a soft bed, such as a feather-bed. In fact, if there were less feather-beds in use people would be all the better for it. A firm, strong mattress is required, and it is always advisable to have a draw-sheet placed ready for use. This should be folded four or five times, and should reach across the bed from side to side and from the middle of the patient's back to the knees. See that it lies smoothly and evenly without any wrinkles, and, when a portion is soiled, it is rolled up, and a clean portion smoothed out under the patient with as little disturbance as possible.

The bed should be well warmed with hot-water bottles. These should always be provided with flannel coverings to lessen the risk of burns. The patient must be got to bed with as little discomfort as possible. Place the stretcher on the floor at the foot of the bed, and lift the patient as indicated above by two or three persons standing at the side and passing their hands beneath. The patient is then lifted and carried carefully to the side of the bed. The clothes have previously been removed or else folded over to the other side for the whole length of the bed. The bearers step forward close to the side of the bed and lay the patient carefully in position. The clothes are then laid over. In the case of broken legs or injuries to the body, where the pressure of the clothes would cause discomfort to the patient, some kind of a guard must be improvised to keep the clothes off the injured part. A three-legged stool or a cardboard box, with the ends cut so that the leg can pass beneath, does admirably, or the clothes may be held up by being pinned to a cord which is tied to the bed or to a nail in the wall.

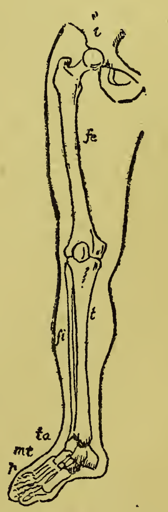
When the patient has been attended to, there are some steps which may be taken to prepare for the doctor, who should have been informed, as far as possible, of the exact nature of the accident.

Place a small table near the bed on one side to be ready for the doctor when he wishes to use it. Have a good supply of hot and cold water and a number of basins, along with some receptacle to hold the used water and dressings. Have also a good supply of towels, clean and dry. If there are children about the house, send them away from the house altogether to play in charge of some responsible person in whose keeping they will be perfectly safe, with instructions not to bring them back till they are sent for.

FRACTURES

BONES OF ARM AND HAND.—*s*, scapula; *cl*, clavicle; *h*, humerus; *r*, radius; *u*, ulna; *c*, carpus; *mc*, metacarpals; *p*, phalanges.

A fracture may be defined as a sudden solution of the continuity of a bone, or, in the simplest language, a break. In order that a proper understanding of the subject of fractures may be had it is necessary to know a little of the various bones of the body. The skull, though made up anatomically of several different bones, may be considered as a single bone from the first-aid point of view. The vertebral column extends from the skull down to pelvic bones which form the buttocks or haunch. The ribs, twelve in number on each side, pass from the vertebral column behind to the sternum in front and form the walls of the chest. The sternum or breast bone reaches from the root of the neck in front to the pit of the stomach on the abdomen. The clavicle or collar bone extends from the upper part of the sternum to the shoulder. On the back of the chest on either side lie the scapulæ or shoulder blades, portions of which help to form the shoulder joint. The upper arm is formed by the humerus, which extends from the shoulder joint to the elbow. In the forearm are two bones, the radius, which runs from the outer side of the elbow to the thumb side of the wrist, and the ulna, which runs from the inner side of the elbow to the little finger side of the wrist. The wrist is made up of several small bones, closely connected together, from which spring the five metacarpal bones, which run along the hand to the fingers and thumb. In the thumb there are two bones, known as phalanges, and in each of the fingers there are three. The bones of the leg are somewhat similar to those of the arm. In the thigh there is the femur, running from the pelvis to the knee joint. In front of the knee joint is the patella or knee cap: in the leg the fibula runs from the outer side of the knee to the outer side of the ankle, the tibia or shin bone runs down on the front and inner side. The heel and arch of the foot are made up of a number of bones, larger than those of the wrist, from which run the five metatarsal bones to the five toes. The toes are formed of phalanges in a similar manner to the fingers.



BONES OF THE LEG AND FOOT.—*i*, innominate bone; *fe*, femur; *t*, tibia; *fi*, fibula; *ta*, tarsus; *mt*, metatarsus; *p*, phalanges.

A fracture is caused by violence of some sort or other. The violence may be direct, indirect, or due to muscular action. Direct violence breaks the bone at the point at which it is applied, as in the case of a blow on the head, fracturing the skull, or a cart wheel passing over a leg, breaking the tibia and fibula. Indirect violence breaks the bone at some point other than the point of application, as in the case of a fall on the hand, which breaks the radius. Fractures due to muscular action are not so common as the former, and are due to a sudden strain on the muscles. The humerus has snapped across on throwing a stone, and the patella may fracture from muscular action in attempting to avoid falling backwards when the leg is bent at the knee.

The line of fracture in a long bone may be transverse, that is to say, at right angles to the length of the bone. Such a fracture is usually caused by direct violence. In a fracture caused by indirect violence the line is usually oblique, and the fragments tend to slide past one another. A special form of oblique fracture is known as the spiral, in which the bone is broken by a twisting force which causes it to break along a spiral curve, as when the leg is suddenly twisted with the foot held in a hole as in a vice, or the inner side of the foot prevented from turning by the edge of a carpet. In the skull there is a special fracture, known as the depressed fracture, where a portion of bone is sunk into the head as by a blow from a hammer.

A simple fracture is one in which the bone is broken without any laceration of the skin in the immediate vicinity. The soft part around the bone may show considerable bruising, if the violence has been direct, but the skin is unbroken and there is no communication between the broken ends of the bone and the outside. In a compound fracture there is also a wound of the skin and of the soft parts around the bone, so that there is some communication between the broken ends of the bone and the outside. If the violence which caused the fracture has been direct it may also have caused the wound in the skin, and the soft parts or the ends of the bone may have been forced through the tissues and the skin. If the violence has been indirect, the skin injury at the seat of fracture can only have been caused by the fragments of bone. In a complicated fracture there is, in addition to the break in the bone, some other injury to an important organ, as an opening into a joint in the vicinity of a long bone or an injury to the lung in the case of fractured ribs. In an impacted fracture the violence which caused the fracture continues to act for a time and drives the broken ends of the bone into one another. In a comminuted fracture the bone is broken into several pieces. A greenstick fracture occurs in children, in whom the bones are softer than in adults, and consists rather of a bending and splitting of the bone, as happens when a fresh green stick is bent too forcibly. A fracture which was simple at the beginning may be transformed into a much more serious compound or complicated one either by movement of the patient or by careless handling of the patient or his injured limb by an assistant. Age has an important bearing on fractures. In young children fractures are least common; they are most frequent between the ages of fifteen and thirty, and become much less frequent in old age as the exposure to violence is considerably lessened.

Diagnosis of Fractures.—The diagnosis of a fracture is, in many cases, the work of an instant, and even to the untrained eye is a matter of a glance, but at other times it may be a matter of no little difficulty even to the experienced surgeon. Nowadays, however, it is always possible to recognise the slightest break in a bone by means of the X-rays. Cases of injury in the neighbourhood of a joint, cases in which there is great swelling, and cases in which only one of the two bones of the forearm or leg may be broken, involve the greatest difficulty, especially to the assistant rendering first aid. In all such cases where there is any doubt it is wiser to proceed as though a fracture had been diagnosed, and to modify the treatment accordingly, as by treating the injury as one of lesser severity, it may be made into one of much greater seriousness. The first-aid assistant, even though he may not be able to do very much to minimise the danger, can at least, by exercising due precautions, prevent its becoming any more serious once he has taken charge of the case. There are several signs which are of importance in helping one to arrive at a diagnosis of a fracture. First of all is the history of the accident, which may be obtained from the patient himself or from some one who has witnessed the accident. The position of the patient and his state of preparation in the way of anticipating the accident and preparing or not to meet the force are of the greatest importance, as is the direction in which the force was applied. From a consideration of these points in the history of the case it is often possible to say if a fracture has occurred, and where it is, before any examination of the injured person has been made. Always inquire if any sound has been heard, as in many cases the break is accompanied by a sharp report which may be sufficient to remove any doubt as to what has occurred. Typical histories of the special fractures will be given as each is considered in detail, and a knowledge of the manner in which each one may be caused will be of the greatest aid in enabling the assistant to know what to expect, and to look for it, if not actually to find it. It is always easier to find a thing if one has an idea as to where it is likely to be.

Most fractures are accompanied by pain at the site of the fracture. In the case of a fracture due to indirect violence there may be pain also at the point at which the violence was applied; in such a case, if pain is found at another point of the bone it is strong evidence of a fracture there. The pain may show itself in one or other of three ways. It may be constant in the injured part, and may require no movement or manipulation to excite it. If the violence has been direct there is usually some bruising of the soft tissues which would give rise to pain of this nature even if no fracture be present; such pain, however, when the violence has been indirect, is strongly suggestive of a fracture. The pain again may only appear when the limb is moved, and is of much greater importance than the former. The third form of pain is that which is experienced when the injured part is pressed upon. This is really tenderness, and is of great value in diagnosing a fracture, more especially so if the pain is experienced at the injured point of a bone when pressure is made at some other point on the same bone. Swelling usually comes on rapidly about the point of fracture, and is due to the force which caused the fracture and to the displacement of the fragments. There is generally some discoloration of the skin, even in cases where the violence was indirect, owing to the effusion of blood into the tissues. This is best marked when the broken bone is close to the skin surface. When a limb is broken there is usually an alteration in its length as compared with the sound one on the other side. The broken limb is usually the shorter of the two.

If a bone is broken completely across, either transversely or obliquely, it is unable to perform its usual function. The normal movements of the part cannot be carried out. It must be remembered, however, that if the fracture is not complete all the movements may be performed as usual. This may also be the case if the broken ends have become impacted or if only one of the two bones in the forearm or leg be broken. Consequently, though impairment of the function of a bone is strongly indicative of a fracture, the full performance of it does not by any means exclude the presence of a break. In addition to the shortening which has been already mentioned, the limb may be deformed. The amount of deformity will vary with the direction of the break, and with the displacement of the fragments. Its presence and degree can be estimated by comparison with the uninjured limb on the other side. The displacement of the fragments will cause an irregularity of the bone which may be seen if the bone is close to the skin, or if the fracture is compound the fragments may be seen in the wound. In looking for irregularity, always compare corresponding bones on opposite sides for any points of disagreement. There remain two important signs which are most useful in helping to diagnose a fracture, but should only be employed by a medical man or under his direct supervision, as they are altogether contrary to the great rule of the first-aid assistant to do nothing that may increase the severity of the injury. A broken limb will show movement at the site of fracture, almost as though there were an extra joint at that point. This may appear when the patient moves the limb or only when the broken fragments are moved the one upon the other. There is a peculiar grating sound caused by the rubbing of the broken ends on one another when they are moved. This is known as crepitus, and is absolutely diagnostic of a fracture. These last two signs, however, should not be attempted by the first-aid assistant.

Differential Diagnosis.—By differential diagnosis is meant the consideration of all forms of injury which may in any way present symptoms of a similar kind, and ascertaining exactly which of these particular injuries is present. In the case of fractures we have to distinguish them from bruises, sprains, and dislocations. In a bruise there may be pain, swelling, and discoloration, as well as some interference with the movements of the limb. There will be no unnatural mobility, crepitus, or alteration in the length of the limb. A sprain is found in the region of a joint, and will tend to limit the movements there, whereas a fracture will amplify them. In a dislocation we may have pain, swelling, and discoloration, but the joint will be fixed and immobile, while if the dislocation is reduced the deformity disappears, whereas when a fracture has been set the broken portions of bone tend to separate again and take up abnormal positions. If the injury has not been seen at once but only after some time has elapsed, and especially if it be near a joint, it may be no easy matter to decide what its exact nature is. If the swelling be very great and the part very tender, warm fomentations must be applied to reduce the swelling and alleviate the pain, and so make the examination less difficult.

When a bone has been broken it must be set, that is to say, the ends must be brought into a position and retained there in the position which resembles as far as possible the normal position of the parts. Healing then takes place at the site of the fracture, and, as a rule, the resulting bone is as strong as it was before. In cases of old persons there is always a risk of proper union not being obtained, consequently a bad fracture is always more serious in an aged person than in a young adult. To hasten the union and to secure that the portions of the bone unite in the proper positions, the part must be kept at rest. For this reason splints are used, and should be of such length that they extend beyond and fix the joints on either side of the fracture. It is only by securing this that the fragments can be kept at rest properly. A broken bone is set by the method of extension and counter-extension. The lower fragment, which is usually drawn upwards by the action of the muscles attached to it, is pulled gently but firmly downwards, while the upper fragment is pulled upwards. In this way the displacement is corrected and the ends of the bones are carefully moulded into apposition. To retain them in this position it is usually necessary to continue the extension on the lower portion by means of a weight attached to a pulley, in addition to the use of splints. This has the additional effect of preventing the shortening which is so likely to ensue, unless carefully prevented. A fracture of a bone in the upper limb usually requires from three to six weeks to unite properly; in the lower limb it takes from six weeks to two months, or even longer.

First Aid in Cases of Fractures.—The object of the first-aid assistant in such cases is to prevent any further damage than has already been done, and to enable the patient to be moved to a place of safety without any risk. The great danger of a compound fracture becoming infected, from contact with outside materials and the consequent risk of general blood-poisoning and septic infection, together with the ease with which a simple fracture may become compound, renders necessary careful and prompt handling of the case. For this reason the injured person must on no account be moved before the limb is secured in emergency splints of some kind or other. No matter where the accident may have occurred, no matter how inconvenient the place may be or how near to a place of comfort and security, the limb must be rendered immobile before the patient is moved. This is done by making use of any articles at hand which can be used as emergency splints, as has been already indicated. Before applying the splint the limb must be straightened with the greatest care and gentleness.

If shortening has taken place in a fracture of any of the bones of the leg, it should be pulled on till the length of the two limbs is as nearly as possible the same. Remember that the splints should be long enough to fix the joints on either side of the fracture, and they must be carefully padded so as to fit the limb accurately. The splint should be bandaged on each side of the fracture, and above and below the neighbouring joints; the upper of the two bandages in the vicinity of the fracture should always be applied first. In all cases of compound fractures, if there is severe hæmorrhage owing to an injury to a large vessel, it must be controlled in the manner already indicated, and the wound must be kept free from contact with any articles of clothing, &c. A clean dressing should be applied to the wound. The patient must be moved with care, and in all cases where there is a fracture of the spine, pelvis, or leg he should only be moved on a stretcher. There is always a certain amount of shock associated with a fracture, so it is necessary to keep the patient as warm as possible.

SPECIAL FRACTURES

The Skull.—The upper part of the skull is usually fractured by direct violence, as a blow on the head or a fall from a height. The fracture may be simple or compound, and is a very serious matter. There may be some swelling, and discoloration. The bone is irregular on the surface, and the edges may be felt projecting above the level of the depressed portions. The patient is generally insensible. The base of the skull is usually broken by indirect violence, as a fall on the head or on the feet or a blow on the jaw. The patient is usually insensible, and blood may issue from the ear, nose, or mouth. The escape of blood, along with a clear, yellowish fluid from the ear, is strongly suggestive of a fracture of the base of the skull. The danger, even in a simple fracture, is injury to the brain, and the patient should be moved as soon and as carefully as possible on a stretcher to his home, or to a hospital, where a thorough examination by a medical man must be made.

Lower Jaw.—This is usually broken by direct violence, such as a blow or a fall on the chin. It may be broken in front or at the sides. There is pain and swelling, the line of the teeth is altered, and the gums bleed. The patient is unable to open and shut the mouth freely, and has difficulty in speaking. If the lower jaw be broken on one side it will be twisted towards the injured side, whereas if it is dislocated on that side it will project towards the other. The attitude of the patient is characteristic: he attempts to support the broken jaw with his hands, and keeps it as steady as he can even when speaking or swallowing.

Fracture of lower jaw — Narrow bandage.

The treatment is simple. Press the injured jaw against the upper part of the mouth, and apply a narrow bandage to retain it in position. This is best secured by placing the centre of the bandage under the chin and passing one end round the side of the face, over the head, and down the other side to meet the other end of the bandage at the angle of the jaw. The ends are here crossed, and the longer one passes across the chin to the back of the head, where it meets the other and is tied. A special bandage for this fracture is the four-tailed bandage, which has already been described. The chin is placed in the slit made in the centre of the bandage. The two lower ends are taken

Fracture of lower jaw—Four-tailed bandage.

up on either side of the face, in front of the ears, and tied on the top of the head. The two upper ends pass across the jaws on either side below the ears and are tied at the back of the head. The loose ends are now tied together over the head to prevent slipping. Small pads of cotton wool, or pieces of soft cloth should be placed below the knots to prevent their pressing on the head and causing discomfort.

The Nose.—The framework of the nose is composed partly of cartilage and partly of bone, the bridge being formed of two bones which meet in the middle line. These may be broken by direct violence as a blow or fall. A cricket ball or a hockey stick is a not infrequent cause of this accident. The outline of the nose is altered, being pushed over to one or other side, or the bridge may be flattened. There is pain and swelling and the nose usually bleeds. If the swelling is severe it may not be easy to make out the displacement, and may require the application of hot fomentations to reduce it. The bones can usually be replaced fairly easily by manipulation with the fingers or with some hard object such as a pencil. To keep them in position it may be necessary to plug the nose, as has been shown in dealing with hæmorrhage. They may be secured in position also by means of some adhesive plaster passing over the bridge of the nose and on to the cheek bones. If the bleeding is excessive it must be controlled by the methods indicated in the section on hæmorrhage. It is advisable to have the bones placed in position by a doctor, as otherwise a permanent disfigurement may be left.

The Spine.—The vertebral column is usually broken by indirect violence as in a fall from a height on the head or the feet, the patient's back being doubled up. Many broken necks occur in this way. Another form of indirect violence causes a fracture of the spine, when a heavy weight falls on the head or shoulders of a person who is in a stooping position. This is especially liable to happen to miners. Direct violence causes fracture when a weight falls on the spine of a man lying on his face on the ground, or when a man falls from a height and strikes a bar or large stone in such a way that his back is struck by it. A fracture of the spine is usually accompanied by a dislocation of some of the segments which press on the spinal cord and injure it in such a way as to cause death either immediately or after some days or weeks, or to leave permanent paralysis, especially of the lower part of the body. The first-aid assistant should not waste time in attempting to find out whether there is a fracture or not. The history of the accident and the general state of the patient will be enough to render obvious the necessity for careful and prompt removal to a place where medical aid can be effectively given. The patient should not be allowed to move, and should not be moved till he has been prepared for it in the manner to be described. He must be lifted with the greatest care, so that no strain is put on his injured back. This is best done by passing a stout stick or pole along either side of his coat, the collar of which has been turned up to allow of their free insertion. Button the coat carefully in front over the sticks. Tie a bandage or handkerchief between the sticks and below the head so that the latter can rest on it. The patient is raised by an assistant grasping the stick on either side through the coat, with one hand near the neck and the other over the abdomen. Another assistant grasps the clothing at the hips, and a fourth takes hold of the legs. The patient is thus lifted and placed gently on a stretcher which has been previously prepared.

The Ribs.—The ribs may be fractured either by direct or indirect violence, and in rare cases by the muscular action in severe coughing or suddenly starting to run. If the violence is direct the rib breaks at the point of application of the blow, and the ends of the bone are driven inwards in a manner which may cause the fracture to become complicated by injuring the lungs or some internal organ. When the violence is indirect, as in the case of a crush or the passing of a wheel over the chest, the ribs tend to break at the sides of the body. The fourth, fifth, sixth, seventh, and eighth ribs are those which most commonly give way in this manner. Apart from the history of the accident, which is generally such as would lead to a suspicion of broken ribs, the symptoms are usually distinctive. The patient may be well aware that something has given way in the chest wall; there may even have been a distinct snap. If he coughs there is a sharp stabbing pain, which is also felt when a deep breath is taken. For this reason the breathing is usually kept well under control, and is feeble and quicker than usual. On pressing on the ribs the patient experiences pain at the seat of the fracture; the same pain is felt if the hand is laid on the breast bone and pressed backwards. A severe bruise would give very much the same symptoms as these, but if the patient finds that he is unable to lie down owing to the increasing severity of the pain, it is a strong indication that the ribs are actually broken. If the lung is injured there may be bright red blood coughed up, while if some of the internal organs, the liver or the spleen, have been pierced, there may be signs of internal hæmorrhage.

If the fracture is uncomplicated, much relief can be given to the patient by applying bandages to the chest so as to support the ribs and control their movements. Two broad bandages should be applied, one above and one below the injured ribs so as to overlap slightly, and tied sufficiently tightly to relieve the embarrassment to the breathing. The knots should be tied in front on the sound side of the chest. A roller bandage may also be used and must be firmly applied. If a many-tailed bandage is available it will be found to answer the purpose admirably. In order to relieve the injured side from the discomfort caused by any movement of the arm, it should be supported in a sling. The patient may be able to walk with the assistance of a helper on the sound side. If an internal organ is injured and the patient shows signs of internal hæmorrhage, lay him down flat, somewhat inclined towards the injured side. This will limit the movements of that side of the chest in respiration. The clothing should be loosened and an ice-bag may be placed over the injured area. When a stretcher has been secured or improvised the patient can be moved carefully and put to bed, till seen by a doctor.

The Pelvis.—The pelvis or haunch bone may be broken by severe crushing violence as the falling of a heavy weight or the passing of a wheel over the lower part of the abdomen. It may also be fractured by violence applied to the fork, as in falling on a bar or by the legs being forced widely apart. There is always the risk in this case, as in that of the ribs, of the fracture being complicated by some injury to an internal organ, which may be much more serious than the fracture itself. The patient experiences a marked degree of shock in all pelvic fractures, and there is pain and tenderness at the seat of fracture on pressing the hips together. The patient may be unable to stand and may only be able to move the legs with much difficulty and pain. A broad bandage should be applied round the hips to keep the parts at rest, or a many-tailed bandage may be available. The legs should be bandaged together above and below the knees, a pad having been placed between them. The patient is then moved on a stretcher and must be kept as warm as possible on account of the great shock.

The Collar Bone.—The clavicle or collar bone is probably more frequently fractured than any other bone in the body, and a great number of the cases occur in children, where the fracture is of the green-stick variety. The commonest fracture is one caused by indirect violence, such as results from a fall on the outstretched hand, on the elbow, or on the side of the shoulder. In this case the fracture is oblique and the fragments tend to slip over one another, the inner edge of broken bone lying above the outer and making a well-marked projection. The shoulder falls inwards towards the chest, the arm is pulled forward over the chest and droops downwards. The attitude of the patient is such as to lead to an easy diagnosis. He stands with the head inclined towards the side of the injury and supports the arm by holding the elbow with the opposite hand. All the typical signs of a fracture are present in this case. When the violence is direct, as by a blow on the top of the shoulder, the displacement is not so marked, but there are pain and tenderness at the point, with restricted movement of the arm. Both clavicles may be broken by a fall with both the hands stretched out or by a severe crushing across the shoulders. In such a case, in addition to the above symptoms, the patient will experience considerable difficulty in breathing, as certain muscles used in the acts of respiration are thrown out of action, and the weights of the arms press the chest inwards. A greenstick fracture in a child may show an obvious bending of the bone. There will be pain and tenderness on pressing the bone, and a disinclination to use the arm freely. The first-aid treatment of a fractured clavicle is practically the

Fracture of clavicle—Pad and sling.

same as the proper surgical treatment, and consists in bandaging the arm in such a way that the displacements are counteracted, when the bone will heal of its own accord. The coat should be removed, as it hampers the free movement of the arm: the sleeve should be cut out and the seam on the shoulder ripped open if there is much pain. It may be possible to remove it by first freeing the sound arm, when the other sleeve may be withdrawn without any discomfort to the patient. A triangular bandage is used to form a sling in which the forearm on the injured side rests, the sling being fastened over the sound shoulder. Place a pad of rolled-up cloth about the size of a tennis ball in

Fracture of clavicle—Two handkerchiefs.

the armpit on the injured side; this prevents the arm falling inwards towards the chest. The corner of the triangular bandage is folded over the elbow and pinned to the front of the bandage. Next pass a bandage round the elbow and chest and tie it securely so as to press the shoulder out over the pad which has been placed in the armpit. The sling must be pulled sufficiently tight to support the weight of the arm and counteract the downward displacement. An excellent method is to employ two handkerchiefs which are folded up with pads placed in the centres. The padded portions are placed on the tips of the shoulders; one end passes over the back of the neck, the other passes under the arm to the back of the chest. The upper end on one side is tied to the lower end on the other side, and vice versa. This braces back the shoulder, and the forearm is, as before, placed in a sling. This method is especially suitable when both clavicles are injured. In case of a greenstick fracture it is usually only necessary to put up the arm in a sling, as the bone tends to straighten itself as it grows. A fractured clavicle is usually perfectly healed in three to four weeks. In most cases there is some slight deformity left in the bone, which does not, however, impair the function of the arm. In men this is a matter of no importance, but it may be a source of annoyance to a young lady, who does not wish it to show when she is in evening dress. If a lady sustains a broken collar bone she can ensure that no deformity will remain if she is willing to lie at rest on her back for three weeks. This is not an easy thing to do, but the result to be achieved may make it less irksome than it might be.

The Shoulder Blade.—The shoulder blade or scapula is not frequently broken. When it does happen, the cause is a heavy blow or gunshot wound, which usually gives the patient a severe amount of shock. There is very little displacement, and if there be much swelling it may not be easy to

Fracture of shoulder blade.

recognise that a fracture has occurred. There is great pain on moving the shoulder and crepitus can usually be heard on so doing. The coat should be removed as before and a broad bandage placed in the armpit on the injured side, the ends of which are crossed over the opposite shoulder and tied underneath the sound armpit. The forearm is then supported in a sling.

The Upper Arm.—The varieties of fracture of the humerus are numerous, but for purposes of first-aid work they may be divided into three classes, as the first-aid treatment is the same for all the fractures in each class. The three classes are: (1) Fractures of the upper end, near the shoulder joint; (2) fractures in the middle of the bone; (3) fractures of the lower end, near the elbow joint. The diagnosis of the second class is comparatively easy: in the other classes there is the added difficulty of the proximity of the joint and the doubt as to whether the injury has taken the form of a fracture or a dislocation. This is especially difficult to ascertain in injuries near the shoulder joint, and it may be of considerable use to notice the distinguishing features of each. In a fracture the arm can be moved with greater freedom than usual: it is fixed in a dislocation, and can only be moved with difficulty. When the bone is replaced in position it will slip out again if it is a fracture, it will remain in the case of a dislocation. The hand of the injured arm can be placed on the opposite shoulder with the elbow at the same time touching the chest where the arm is broken, but not when there is a dislocation. In a dislocation the head of the bone can be felt out of its socket, in a fracture it is in its usual position. The elbow on the dislocated side stands out from the body, if the arm be broken the elbow hangs against the side. In connection with fractures near the elbow joint there are one or two special points of difference, apart from the general differences in all cases of fracture and dislocation. In the first place the fracture is caused by a fall on the elbow, whereas the dislocation is caused by a fall on the palm of the hand. In the case of a fracture the prominence of the elbow on the back of the arm is made more evident when the arm is extended, the reverse is the case in the case of a dislocation. The lower end of the upper fragment can be felt as sharp and rough in the fracture: in the dislocation it is rounded and smooth. A consideration of these points will enable a conclusion to be formed as to the exact nature of the injury. The fractures are usually caused by direct violence such as a blow or a fall against some hard object: the shaft of the bone may be broken by sudden muscular action, as in throwing a stone.

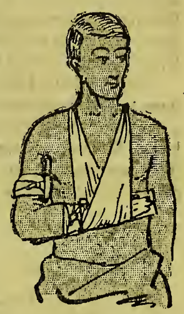
Fracture of humerus near shoulder joint.

When the fracture is in the neighbourhood of the shoulder joint, the arm should be bandaged to the side of the body, either by means of a few turns of a roller bandage or by a broad triangular bandage. The forearm should be supported by a small arm sling, which allows the elbow to hang freely and to overcome the shortening by its own weight. In this case the body is made to act as a splint.

When the bone is broken in its shaft, the fragments require to be steadied and kept in position by means of splints. Pieces of wood are the most suitable, but anything which is at hand may be utilised. Bend the forearm over on the chest and apply splints, a short one on the inside, reaching from the armpit down to an inch above the elbow joint. Care must be taken not to have this so long as to press on the upper surface of the forearm. On the front and outer aspect of the arm place splints reaching from the shoulder to the elbow, and secure all in position by means of bandages above and below the seat of the fracture. The forearm should now be supported in a small arm sling. If no splints are available, bandage the arm to the body, which will act as a splint.

Fracture of humerus, middle of shaft.

When it has been ascertained that the humerus is fractured just above the elbow joint, a special splint must be provided. This is best made by using two pieces of wood, one much longer than the other, which latter should be of sufficient length to extend from the armpit to below the elbow. The exact length may be estimated by using the sound arm as a guide. Tie the two pieces securely together at the ends so as to form a right angle and apply the splint so made to inner side of arm so that the bent forearm lies along the longer portion. Secure the splint in position by bandaging the upper arm above the fracture and the forearm below it, and support the whole in a large arm sling. All these splints are applied over the clothes, and must be padded with soft cloths to prevent any pressure on the parts.



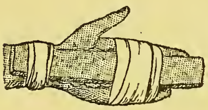
Fracture of humerus near elbow joint.

The Forearm.—When both bones are broken all the signs of a fracture are present: when only one is affected there are pain, swelling, discoloration, difficulty in moving the hand, tenderness on pressure and irregularity of the bone. These fractures are caused by direct violence, most frequently by a blow of some sort or in preventing a blow aimed at the head from a stick, the arm being raised to cover the head. Two splints are necessary, and each should be broader than the arm at its widest point, to prevent the two bones being pressed together. The forearm is flexed with the thumb uppermost and a splint is placed on the inside as well as on the outside of the arm. Both splints must be securely padded. Towels, dusters, handkerchiefs may be used for this purpose. The splints are bandaged both above and below the fracture and also to the hand, and the whole is supported in a large arm sling.

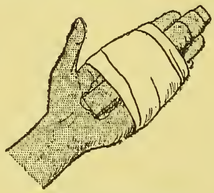
Fracture of forearm—Both bones broken.

There are two special fractures of the radius which require to be mentioned, as they are of fairly frequent occurrence. One is known as the chauffeur's fracture, and occurs from the recoil of the crank by back firing in starting a motor car. It resembles in some respects the second and better known fracture, namely, Colles' fracture. This results from a fall on the palm of the hand, the hand being turned backwards and the ball of the thumb being the first part to come in contact with the ground. It is a frequent accident in skating rinks. There is a marked projection on the radius above the wrist on the back, and the fingers, which are partially flexed, are turned towards the little finger side of the hand so that the appearance of the hand and wrist is like an inverted spoon. The patient supports the wrist in the other hand and presents a picture which makes the diagnosis evident. Special splints are employed in the treatment of these fractures, but for first-aid work an ordinary splint or piece of wood, well padded to support the hand in the position in which it lies with least discomfort, is all that can be used. The arm may then be supported in a sling.

Bones of the Hand and Fingers.—These bones are usually broken by direct violence, such as a blow or a fall on some sharp object. When a bone of the hand is broken the only signs are pain, swelling, discoloration, and tenderness on pressure. The other bones of the hand act to a certain extent as



Fracture of metacarpal.



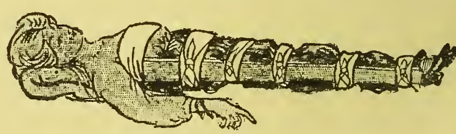
Fracture of finger.

splints. A carefully padded splint should be applied to the palm of the hand, extending from the tips of the fingers to beyond the wrist, and securely bandaged. If a finger bone is broken the same method may be adopted, or a small splint may be applied to the injured finger and bandaged to it, while the fingers are all bandaged together to act as additional splints. In each case a large arm sling should be used to support the arm.

The Thigh Bone.—The femur or thigh bone is one of the strongest bones in the body, and especially in its upper portion is well surrounded by soft structures which afford it admirable protection. Consequently it is not so frequently broken as some other bones: most cases of fracture are found in aged persons in whom the bone undergoes some alteration of shape and becomes more brittle. The violence may be direct, as by a severe blow or by a wheel passing over the thigh, or indirect, as in a fall, especially a fall on the side of the hip. In elderly persons a frequent cause is a fall on the side owing to tripping, say on the edge of the pavement. As in the case of the humerus, the fractures of this bone may be divided into three classes: (1) Fractures near the hip joint at the upper end; (2) fractures in the shaft of the bone; (3) fractures at the lower end, near the knee joint. The main points of difference between a fracture high up in the bone and a dislocation at the hip joint may be noted. In a fracture the limb can be freely moved, whereas in a dislocation movement is a matter of no little difficulty. The head of the bone cannot be felt in a fracture: in a dislocation it can easily be felt, usually on the back of the buttock. In a fracture the foot is generally turned outwards, as though falling away from its fellow: in a dislocation it is turned inwards, and may even rest on the other foot or leg. In both cases the limb is shortened when compared with the sound limb on the other side. The patient is unable to stand up, and if, when lying on the ground, he is unable to raise the foot from the ground, there is every likelihood of a fracture. Two splints are needed in this case, though we may often have to be content with one. This must be long enough to reach from the armpit to below the foot, and as an emergency splint, nothing better can be used than a long-handled brush. With the patient lying on his back, the leg is secured by grasping the ankle and foot, while another assistant steadies the hips.

Thigh—Fracture of shaft (man).

The leg is then straightened and pulled as nearly as possible to its original length, and the foot is held in good position. The long splint, well padded, is placed along the side of the body and the leg, and is secured in position by bandages round the chest and the hips. Bandages are also applied above and below the fracture: these pass round the second, shorter, splint which has been placed on the inside of the leg, from the fork down to beyond the foot. Another bandage should be applied round the leg to steady the splints, and one round the ankle and foot in such a way that the foot is kept in the desired position. Both legs are then bandaged together and the patient is in a position to be moved on a stretcher, on which he should be carried feet foremost except when going down hill. If only one splint is available, or if the patient is a woman, the bandages may all be passed

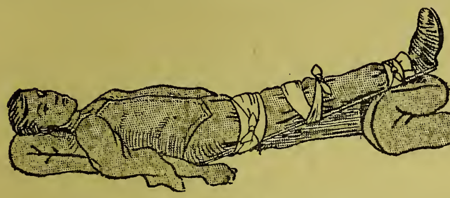


Thigh—Fracture of shaft (woman).

round both legs, the sound one of which is made to act as the short splint. The treatment for fractures in the shaft and at the lower end of the bone is the same. There is not the same difficulty in diagnosis at the lower end, as it is very rarely that the knee joint is dislocated, and even when that has happened, it presents such a distinctive appearance that there is no room for doubt.

The Knee Cap.—The knee cap or patella may be broken by direct violence by a fall on the knee, or by a severe blow: more usually, however, it is broken by muscular action, as in the sudden attempt to prevent a fall backwards by bracing up the muscles of the thigh when the knee is bent. The symptoms are usually clear and distinct. There is pain and tenderness, the limb is quite useless, and hangs helplessly, and the surface of the bone is irregular: there may even be a distinct gap between the fragments. As the action of the muscles of the thigh tends to keep the fragments separated, they must be relaxed as far as possible. This is done by keeping the patient on his back with his head and shoulders raised, and by placing a splint below the leg from the buttocks to the foot, and keeping the latter raised on a pillow or log of wood.

The splint should be bandaged to the leg round the thigh and at the ankle. Greater comfort can be given to the patient by applying bandages above and below the same in such a manner as to press the two portions of the bone together. Place a narrow bandage with its centre on the thigh above the knee, cross the ends behind the knee over the splint, and bring them up to the front of the leg



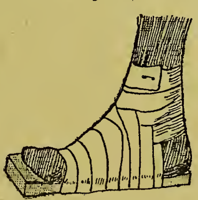
Fracture of patella—Splint on back of leg.

below the knee where they are tied. This will pull the upper fragment down. A similar bandage applied below the same and fastened above will pull the lower fragment upwards. The patient may then be placed on a stretcher with a pillow under his shoulders and the sound leg lying beneath the splint so as to raise the injured limb.

The Bones of the Leg.—These bones are frequently broken by direct violence or by indirect, as a sudden twist of the leg when the foot is held in position by some inequality of the ground. When both bones are broken the diagnosis is easy, as the cardinal signs of fracture are present. If only one bone is broken there may be no displacement or deformity of the leg; the only signs being pain, swelling, discoloration, and tenderness on pressure. Splints should be applied to the inner and outer sides of the leg, reaching from above the knee to below the foot. They must be well padded and secured by bandages round the thigh and at the ankle. Bandages should be applied above and below the fracture, and the two legs kept together by being bandaged round the knees and at the ankles. If only one splint is available, or if the patient be a woman, put the splint on the outer side and pass the bandages round both legs. Carry the patient on a stretcher.

Fracture of bones of the leg—Two splints.

The Bones of the Foot.—These may be broken by a severe crush or heavy blow. There is pain, swelling, and great tenderness, with inability to rest the weight of the body on the injured foot. Place a splint, a short flat piece of wood, below the foot, having previously removed the boot by cutting it off, and bandage it securely by means of some figure-of-eight turns around the foot and ankle. The foot should be kept raised as much as possible.



Fracture of bone of foot—Splint on sole.

SPRAINS

A joint is said to be sprained when it is suddenly and forcibly moved in a direction in which movement is not normally possible or when movement takes place in the normal direction, but beyond the normal limits. The bony parts constituting the joint are moved to too great an extent on one another, with the result that the ligaments which bind them together and limit their movements are stretched or even ruptured. The result is that they become inflamed and the tissues in the neighbourhood of the joint become swollen, painful, and tender, and so render movement of the joint painful. In mild cases the inflammation soon passes away and the injury is quickly recovered from: in more serious cases there may be some damage to the strictures, such as rupture of the ligaments or even fractures of small portions of the bones, which may take a considerable time to recover. A sprained ankle is one of the commonest varieties and gives a clear picture of a typical sprain. There is intense pain in the joint, so much so that it is impossible to use it. There is also much swelling and discoloration. The most important treatment is absolute rest: this is especially so in cases where the back or hips are sprained. The patient must be kept at rest in bed till all the pain and tenderness are gone. In sprains of other joints rest is secured by applying splints as in the case of fractures. Recovery may be aided by means of massage over the swollen area. Light rubbing is all that is necessary, indeed it is all that the patient will permit. It must be light enough to cause no pain: it should rather afford considerable relief. The rubbing should be done with the palm of the hand or the fingers—not with the tips—and should always be in the same direction, namely, towards the heart in the direction of the circulation. It will be found advantageous to use some liniment or embrocation along with the rubbing.

When a sprain occurs, the part should be lightly bandaged and cold water poured on the bandage. This will help to tighten it, and will make the part more easy. It will usually be found that cold-water dressings applied to the joint will relieve the pain. In some cases, however, hot dressings or fomentations will be found to give greater relief. Both may be tried, and the patient will soon decide which he finds the better of the two. The joint should be put up in a splint and bandaged as though for a dislocation. When an ankle is sprained, do not attempt to remove the boot in the ordinary way if there be much pain and swelling. It will have to be cut off by splitting it down the back. In all cases of severe sprains, when the pain and swelling have not passed away in a couple of days, the patient should see a doctor.

BITES AND STINGS

Wounds of this nature, caused by animals or insects, are dangerous, not so much on account of the actual injury to the part, which in many cases is but slight, as because of the poison which is introduced into the system. In some cases this poison is so weak that it merely causes a temporary irritation at the site of the injury; in others it is of such virulence as to cause considerable constitutional disturbance, with vomiting, collapse, and general weakness. The severity of a sting varies, as will be seen, according to the part of the body on which it is inflicted; what would on one part be a perfectly harmless injury may in another situation be a source of very considerable and immediate danger, owing to the differences in the structure of the affected parts. Of course, where a person has been severely mauled by an animal the immediate danger is the loss of blood from the torn or cut vessels; such wounds must be treated along the lines already indicated. We have now to consider rather the special means to be adopted to combat the risk of poisoning which is always associated with such injuries to a greater or less extent, to meet which special treatment is necessary.

Bees and Wasps.—The peculiarity of a sting by a bee or a wasp lies in the fact that the actual barbed sting of the insect is left in the wound, and acts as a source of irritation. The first thing to do is to remove the sting. This may be done by means of a pair of very fine forceps or tweezers. Frequently, however, these are not available, in which case recourse may be had to an expedient which is equally effective and usually at hand. An ordinary watchkey is taken and pressed down firmly over the point of insertion of the sting. When this is withdrawn it will be found that, owing to the pressure on the part surrounding the sting, the latter has been driven up so as to stick out of the wound, and may then be withdrawn by the fingers. This method may also be employed to remove the disfiguring "blackheads," to which the skin of some persons' faces are so liable. Before applying the watchkey in these cases the blackhead and the parts immediately surrounding it should be rendered softer and easier of manipulation by the application for a few minutes of a rag steeped in warm water.

The sting having been extracted, it remains to alleviate the pain and irritation caused by it. This is, as a rule, confined to the actual site of the sting, the tissues around which become swollen, painful, and tender. A homely remedy is the application of a blue bag, which has a very soothing effect, or of a sliced potato. A solution of ordinary washing or baking soda may be used for the same purpose. Undoubtedly the best application is a weak solution of ammonia. A mixture of spirits of hartshorn or sal volatile makes an efficient preparation.

While a sting on the hand or arm or body is of no importance beyond the local irritation, a sting in the region of the neck, and more especially inside the mouth, is always attended with danger, owing to the ease with which the soft strictures in the neighbourhood become inflamed and swollen. The tongue, cheeks, and back of the mouth may become so swollen as to interfere very seriously with the breathing, and may actually cause the patient to choke. In such a case medical aid may be summoned at once, and in the meantime a gargle of hot water, into which some soda has been put, should be used. Cloths wrung out of warm water should be wrapped round the neck, and in cases where the inside of the mouth has become so swollen as to prevent breathing and cause serious symptoms, the cheeks should be incised on the inner surfaces with a sharp clean knife. If the patient exhibits signs of collapse or exhaustion, stimulants should be given, such as warm coffee or a little brandy and water.

A sting in the region of the eye may cause serious symptoms and much inflammation and pain in the tissues around the eyeball. Cloths wrung out of hot water, to which some soda has been added, should be at once applied, and medical aid summoned at once to prevent lasting injury to the organ of sight. When a great number of stings have been inflicted the pain is considerable, and must be allayed by the free use of the weak ammonia mixture, signs of collapse being met by stimulants. Cases are on record in which children and even horses and cattle have succumbed on account of extensive bites by bees and wasps, the constitutional disturbance caused by the severe stinging being very intense.

Jellyfish.—The jellyfish, which is seen in such large numbers at certain parts of our shores, is endowed with a number of stinging cells which can discharge their poison into the skin of a person who comes in contact with them while bathing. The smaller jellyfish are probably harmless in this respect, but as the different species vary in their virulence, the greatest care should be exercised in places in which they abound. Some persons are more susceptible to such injuries than others, and as this can only be discovered by bitter experience, it is wiser to act as one of the particularly sensitive people than to run unnecessary risks. The solution of ammonia and water is the best application for such an injury, and will usually be found sufficient. In severer cases, where there is much inflammation and pain, with the accompanying signs of collapse, medical aid should be secured without delay.

Fleas and Bugs.—The bite of a flea is irritating owing to the itching which it causes. This may be relieved by any soothing ointment or cold cream. Much more important than the treatment of a flea bite is its prevention. All dogs and cats in the house should be periodically sprinkled with one or other of the well-known insect powders, and children especially should be prevented from caressing stray animals. All dogs should be regularly and thoroughly washed, a little disinfectant solution being added to the bath. When fleas make their presence felt in a bed it must be thoroughly cleaned and beaten in the open air, and plentifully dusted with the powder to exterminate all traces of the insects. Fleas, if caught, may be destroyed by pressing them between the finger-nails, or by immersing them in a solution of carbolic acid.

The bed bug is a much more serious danger, and fortunately is but rarely met with. Insect powders alone will not suffice to get rid of these pests. The room must be fumigated with sulphur or brimstone as is done in cases of scarlet fever, and all the holes or cracks in the floors and walls should be treated with a mixture of three parts of petroleum to one hundred parts of water. This will be found effective in getting rid of the bugs. It is said that such bugs only make their appearance in the dark, consequently if a traveller finds himself in a place where he has suspicions of their presence it is a good plan to keep a light burning during the night.

Midges.—Without causing any actual danger, midges may be a source of considerable annoyance and discomfort, especially to persons with sensitive skins. Such persons, who are frequently of the female sex, should beware of such articles of clothing as openwork stockings and what have come to be known as pneumonia blouses, when likely to be in situations where midges abound. Tobacco smoke is a well-known preventive of their unwelcome attentions, or in fact smoke of any kind. This fact is made use of by travellers who, when pitching camp in a region favoured by these insects, keep a fire of chips burning in such a position that the wind blows the smoke over the camping ground. Various preparations may be used on the skin to prevent the midges attacking it. One of the simplest of these consists of equal parts of wood tar and sweet oil. This should be applied to the face, neck, and hands several times a day. It has the additional advantage of preventing sunburn, and is easily removed by washing with soap and water. An ointment made of a drachm of oil of pennyroyal added to an ounce of cold cream will also be found to have a deterrent effect.

Spiders.—In this country spiders are harmless, and bites from them are almost unknown. In other regions, however, there are found very different species of spiders which are capable of inflicting severe wounds, not infrequently accompanied by the formation of abscesses and considerable general disturbances. In North America is found a small black spider which weaves no web and loses no opportunity of tasting blood, especially at night time. It is popularly known as the "hunting spider," and is found in old houses and in dead trees. Another American spider is the tarantula, which is particularly hostile to human beings. In New Zealand there is the katipo or poison spider, which causes great inflammation and collapse. In all these cases the wound should be treated with the ammonia solution, and if it goes on to the formation of an abscess this should be opened with a clean sharp knife, and a fomentation applied. In the severe cases where there is much collapse, following on the inflammation, the patient's general health must be supported by stimulants. Coffee or brandy and water should be used, while, as drugs, the best are quinine, two or three grains of which may be given three times a day, and spirits of ammonia, a teaspoonful in water given with the same frequency.

The Jigger or Sand Flea.—This insect is found in the sand in tropical regions of America, in Africa, and in the West Indies. The female, a small brown flea, burrows into the skin of those who walk on the sands with bare feet. It usually selects the skin round the nails, into which it burrows and grows to the size of a pea, forming an abscess which becomes very painful. The flea should be removed by enlarging the opening in the skin through which it entered by means of a sharp knife or lancet, after which it can be withdrawn by a needle. Care should be taken not to break up the distended insect, as the eggs with which it is filled will be left behind and cause further irritation. When it has been removed the wound should be cleansed with a dilute antiseptic solution, the best agent to use being carbolic acid. The trouble caused by the lodgment of these fleas in the toes can be prevented by proper attention to cleanliness, and by always wearing boots on the feet when it is necesary to walk on the sands in districts where they are found.

Scorpions.—In America the sting of the scorpion is not usually more severe than that of a bee or wasp, and should be treated in a similar manner. In Asia and Africa, however, the scorpion reaches a much greater size, and is capable of inflicting a serious injury, which has been known to result in death. There may be considerable collapse and weakness, necessitating the employment of stimulants as already indicated. Should the bite go on to abscess formation, it must be opened freely by a sharp knife and fomentation should be applied.

Centipedes.—This insect may attain a length of six or eight inches, and has a poison bag lodged within its jaw, so that its bite is poisonous. There is much swelling and discoloration with fever and, it may be, delirium. Stimulants must be given, and the wound treated with the ammonia solution. The poison must be extracted as soon as possible. The longer it is allowed to remain in the body, the greater is the local lesion and the more it is likely to be absorbed by the blood and carried throughout the body, giving rise to general blood-poisoning. The wound should be freely incised, with a sharp knife so as to encourage bleeding with the consequent removal of the poison. The patient himself, if the wound is in an accessible part of the body, or anyone who is on the spot, may proceed to suck the wound with impunity, provided there is no sore or abrasion on the lips or mouth. The poison should be spat out, though it is incapable of doing any harm when taken into the stomach. It is only dangerous when brought directly in contact with the blood. Another method which may be employed is that known as dry cupping. An ordinary tumbler is taken, and a piece of blotting paper or cotton wool, soaked in methylated spirits or alcohol, is placed on the bottom of it. This is set on fire with a match, and, while still burning, the tumbler is held with its rim in contact with the skin round the wound. A vacuum is thus formed, and the blood and the poison are drawn out of the tissues without any risk.

Dogs.—Bites from dogs may be divided into two classes, one in which a perfectly healthy dog accidentally or intentionally bites a person who has been playing with it or annoying it, and the other in which the animal is mad. The great difference between the two cases lies in the fact that whereas the former is a simple lacerated wound which heals, under proper treatment, by first intention, the latter is especially dangerous on account of the risk of hydrophobia developing through the infection conveyed in the saliva of the mad dog. If it were always known whether the animal was mad or not, there would be no element of doubt added to the already serious fear which a bite of a dog always occasions: unfortunately, however, it is rarely known at the time of the accident whether the dog is mad or not. Consequently, as hydrophobia is a disease greatly to be dreaded, it is necessary to act in each case as though the infection were present, more especially as it is possible to counteract and destroy the infection if proper steps are immediately taken.

It will, perhaps, be profitable at this point to indicate the chief signs of madness in a dog, the appearance of which should lead to the immediate destruction of the unfortunate and dangerous animal. The dog becomes dull, listless, and sullen, and inclined to snap at anyone. This snappishness is particularly important as an early sign, and is to be regarded with the greatest suspicion, more especially if a dog, which has always been of a quiet disposition, suddenly shows a tendency to snap indiscriminately at every dog it meets. Its appetite disappears and it insists on eating articles which no healthy dog would touch, and are most unsuitable for food. It may even attempt to eat such substances as wood or coal. It scratches its mouth and ears, and saliva dribbles freely from its mouth. The legs become weak, more especially the hind legs, and the dog generally presents an unhealthy and displeasing appearance. Its bark becomes harsh and rough and frequent, the eyes lose their brightness, become bloodshot, and are usually kept half closed. The coat becomes dull, rough, and shaggy, the animal is usually quiet and peaceful when left alone, but is inclined to snap and be vicious when disturbed.

When a dog shows such signs of madness it should be at once destroyed, as its presence is a potential source of the gravest danger. On the other hand the practice of shooting a dog which has bitten a person is one to be condemned. If the dog is allowed to live and shows no sign of madness, the bitten person may rest secure from any fear of hydrophobia following on the accident, with the consequent relief from anxiety which such knowledge gives. If, on the other hand, signs of madness make their appearance in the animal, all possible precautions must be taken to combat the possibility of infection. The dog should, of course, then be shot. In this connection the words of Charles Lamb should be remembered: "In case the dog goes mad and bites any of the children, have them shot at once, but tie the dog up to see if he really was mad." The second part of the advice is very sound: the first part may have been the more humane treatment of the bitten children in his time, but nowadays we can do much to prevent the supervention of one of the most dreaded of all diseases.

While the main cause of hydrophobia is undoubtedly a bite from a mad dog, it has been known to result from the bites of cats and foxes who are subject also, though to a much less extent, to the disease most commonly found in dogs and known as rabies. In dealing with the bite of a dog or animal from which infection is likely to occur there are three main lines of treatment to be adopted. In the first place, as in all cases of poisoned wounds, the poison must be removed as quickly as possible from the site of the injury. The longer the poison is allowed to remain in the tissues, the greater is the likelihood of its being carried into the other parts of the body, with the consequent disastrous results. The wound should be encouraged to bleed freely, being scarified by means of a clean sharp knife to achieve this end if necessary. The wound should also be sucked by the patient himself, if it is possible, or by an assistant. As long as the skin of the mouth and tongue are intact there is absolutely no risk of infection by doing this. As a further precaution the mouth should be well washed out with an antiseptic solution. To prevent the carrying of the poison by the blood along the blood-vessels a tight ligature or tourniquet should be applied, if the bite is on a limb, just above the site of the wound. To be successful the ligature must be as tightly applied as possible. Anything which is convenient may be used, such as stout cord or string or an elastic brace. Then again what poison may be left in the wound itself must be destroyed. This will involve the destruction of a certain portion of the tissues in the neighbourhood of the wound, but is by far the lesser of the two evils. It is effected by cauterising the part, many methods of doing which are employed. A piece of iron or bar of iron is heated to redness in the fire and applied to the wound: this method is known as the actual cautery. Some gunpowder may be placed on the part and then exploded, or caustic substances may be applied if any such are available. Ordinary lunar caustic or silver nitrate, strong carbolic or nitric acids may be used. This process, though undoubtedly painful, is not nearly so trying as would be imagined, and should on no account be omitted. It is of particular importance in the case of a mad dog bite, as the poison tends to remain in the tissues surrounding the wound for a considerable period before being carried into the body generally, and so can be very effectively dealt with at the site of the injury. In addition to this immediate treatment, in all cases where the animal causing the bite has been proved to be suffering from rabies, the patient should have the benefit of the Pasteur treatment. It is unnecessary to enter into details of the treatment here: it is sufficient to record the fact that the mortality after bites by supposedly rabid animals is, in the most favourable series of statistics, almost twenty per cent., while at the Pasteur Institute in Paris the mortality, in cases where the animal was proved to have been suffering from rabies, is considerably less than one per cent. The cause of the mortality in these cases, low though it is, is the fact that there was too great delay in resorting to the treatment. The mortality would, in all probability, have been considerably less and even negligible had there been no delay in bringing the cases to the institute. It cannot be too strongly emphasized that a practically certain recovery is to be expected if no delay is lost in securing the treatment; grave responsibility rests on those who do not see to it that a bitten person is given every opportunity of benefiting from this really wonderful treatment, which has already been the means of preserving thousands of lives.

How does hydrophobia make itself manifest? This is the question which naturally arises and requires some explanation. All infectious diseases have what is known as a period of incubation, that is to say, that after the infection has entered the body there elapses a certain period before the symptoms of the disease which it causes make themselves evident. This period varies in each disease, and in none is it more irregular than in hydrophobia. The usual period, before which no symptoms appear, is about forty days: cases have been known, however, in which it was as short as a fortnight, and others in which it was delayed for as many as eight months. It is usually shorter in children than in old people. The actual wound has, as a rule, healed, though there may be some little pain or itching in the neighbourhood. The patient then begins to feel unwell, suffers from giddiness, and has frequent chills, after which the more acute symptoms appear. A sudden catch in the breathing is one of the earliest signs, and may be accompanied by a loud hiccough, which is fancifully likened to the barking of a dog. There is also some difficulty in swallowing, especially fluids. The symptoms rapidly increase in severity, so that there is not only the greatest difficulty in swallowing but also in breathing, so that the patient is in constant dread of suffocation. There is a free discharge of saliva from the mouth. The spasms are intensified by any movement or excitement. The mere attempt to swallow any fluid or even the sound of running water is sufficient to set up severe spasms, thus giving rise to the well-known idea of the dread of water. There is usually great mental agitation and despair, the unfortunate patient presenting a very sad and hopeless picture. The end is not long delayed. This can all be avoided by quick and thorough treatment.

Snakes.—In England, fortunately, there is only one poisonous variety of snake, the bite of which is capable of causing death. This is the adder, which is only found in certain districts. In America the most important venomous reptile is the rattlesnake; in Europe is found the viper, while in India, Africa, and other parts of the world there are greater varieties of dangerous snakes. A snake does not bite in the ordinary sense; it rather stings by means of its poison fangs, which inject a thick yellowish fluid which constitutes the venom or poison. The effects vary with the intensity of the venom introduced, depending on the species of the snake, and with the rapidity with which it is carried by the blood into the body generally. If it happens to be introduced directly into a large vein, its effect is especially rapid and serious. It has no effect on unbroken skin, and is harmless when taken into the stomach. This makes it possible to suck the venom out of a wound with impunity. There is intense pain at the site of the injury, with swelling and it may be actual death of the parts immediately affected. The general symptoms vary with the intensity of the venom, and may appear almost at once or be delayed for a few hours. The patient suffers from great shock, becomes faint and giddy, his sight becomes dimmed, and he is in a state of great terror. There is more or less fever and delirium, and in fatal cases death ensues usually within a couple of days. If by this time the end has not come, the chances of ultimate recovery are good. A snake bite is always more serious in the case of a child than in that of an adult.

Treatment is exactly the same as has been indicated for cases of bites by mad dogs. A tight tourniquet must be applied at once above the wound, the poison must be sucked away, and the place cauterised. In addition to this local treatment there must be the free administration of stimulants, and of these the best in these cases is alcohol. This may be given freely in order to counteract the extreme depression which follows on the introduction of the venom. It is astonishing the amount of alcohol which may be taken without producing intoxication in such a case; nor is there any harm in pushing the administration to such an extent that the patient is actually intoxicated. Some authorities advise the excising with a sharp knife of the area including the marks of the fangs and the rubbing in of crystals of permanganate of potash till the surfaces of the wound thus made are black. In addition to this, in all countries where snakes are prevalent, certain antitoxins or antiverins are prepared and can be injected as soon as possible after the injury. This treatment corresponds to the Pasteur treatment for hydrophobia.

A detailed description of the common viper or adder, which is the only poisonous snake found in Britain, may not be out of place. It lives especially on dry heaths and waste places, often among stones and brushwood: it is commoner in Scotland than in England, and does not occur in Ireland. It is widely distributed throughout Europe. Often confused with the innocent grass-snake, it may be distinguished by its markings. It has two diverging marks between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running zigzag along the upper surface the whole length of the body and tail, and a row of small, irregular, almost black triangular spots on each side. The under parts are of a lead colour. The characteristic markings are almost invariable, but the ground colour varies considerably from nearly olive, rich deep brown or brownish yellow, to almost black. Thus in some parts of England a "black viper" is occasionally met with; its ground colour a rich black, and the markings of a more intense black than the rest. There is also the red and the blue-bellied and an almost white viper with black markings. The viper seldom exceeds two feet in length. It feeds on mice, frogs, small birds, and other small animals, which are killed by its poison fangs and swallowed entire. It hibernates during several months of the year, and several may then be found together in a torpid state. It is a good swimmer, and may occasionally be seen on lakes such as Loch Lomond, crossing from one island to another. The young are produced in the early summer, from ten to fifteen or more at a birth. The eggs have soft thin envelopes, and are hatched within the oviduct. The young viper is coiled up so closely in the egg as to appear almost a solid mass, but the moment it is set free it is active, and ready to throw itself into an attitude of defence. It has often been alleged that in times of danger the young of the viper seek refuge in their mother's open mouth, and find temporary protection in her œsophagus, but although this unlikely habit is not impossible, the fact is not supported by sufficient evidence. The viper is naturally shy of man, but when trod on or provoked is, of course, ready to defend itself by biting. The bite is painful and, though not dangerous to healthy adults, is apt to be attended with more serious consequences in the case of children or those of weak constitution. The foregoing description is taken from Chambers's Encyclopædia, and may enable the poisonous adder to be distinguished from its harmless relatives.

Much of the most valuable work in connection with snake bites has been done by Fayner in India, who, in his work on the subject, summarises the treatment in such cases as follows:

"Apply at once a ligature or ligatures at intervals of a few inches, as tight as you can possibly tie them, and tighten the one nearest to the wound by twisting it with a stick or other such agent. Scarify the wound, and let it bleed freely. Apply either a hot iron or live coal, or explode some gunpowder on the part, or apply either carbolic or some mineral acid or caustic. Let the patient suck the wound whilst you are getting the caustic ready, or, if anyone else will run the risk, let him do it.

"If the bite be on a toe or finger, especially if the snake has been recognised as a deadly one, either completely excise or immediately amputate at the next joint. If the bite be on another part, where a ligature cannot be applied, or, indeed, if it be on the limbs above the toes or fingers, cut the part out at once completely.

"Let the patient be quiet. Do not fatigue him by exertion. When, or even before, symptoms of poisoning make their appearance, give the ammoniacal preparation called eau-de-luce, or liquor ammoniæ, or carbonate of ammonia, or even better than these, hot spirits and water. There is no occasion to intoxicate the person, but give it freely and at frequent intervals. If he become low, apply sinapiscus and hot bottles, galvanism or electro-magnetism over the heart and diaphragm. Cold douches may also be useful. If the respiration be failing, artificial respiration, by the Marshall Hall or Sylvester method, may be employed.

"The antidotes, in addition, may be used by those who have faith in them; but, as I have said, I fear that there is no reason to believe that they are of any use. Encourage and cheer the patient as much as possible. As to local effects, if there be great pain, anodynes may be applied or administered, and antiseptic poultices to remove sloughs; collections of matter must be opened. Other symptoms are to be treated on general surgical principles. This, I believe, is the sum and substance of what we can do in snake bite. If the person be not thoroughly poisoned we may help him to recover. If he be badly bitten by one of the more deadly snakes, we can do no more."

Mosquitoes.—The bites of mosquitoes are irritating locally in much the same manner as of midges and similar insects. The irritation may be allayed by the use of the ammonia solution as already indicated. But the main danger from mosquitoes lies not in the local irritation caused by the bite, but in the risk of infection with a malarial fever. It is now known that malaria is conveyed to man by the bite of a certain species of mosquito, consequently by getting rid of the insect from places where it abounds, and failing that by taking such precautions in malarial districts as will prevent their access to human beings by night and the consequent biting, much has been done to secure immunity from malaria in districts which formerly were veritable death-traps.

The mosquito bites by night, consequently it must be prevented from entering houses by using adequate mosquito nets. This protection of the sleepers at night is of the utmost importance. Attempts must be made to exterminate the insect. All ponds and marshes must be drained away, and in the period when malaria is prevalent, petroleum should be freely used in all such places, as it prevents the development of the young mosquitoes. Then, again, all persons going to a malarial region should take, as a matter of routine, a dose of two grains of quinine regularly three times a day. This drug is the great stand-by, not only in the treatment of malaria when it has become established, but also in preventing a person who is exposed to the infection from succumbing to it.

BURNS AND SCALDS

A burn is caused by the application of dry heat, a scald by moist heat, as boiling water or steam. A strong electric current or a flash of lightning may cause a burn at the part of the body with which it comes in contact; severe friction may generate enough heat to scorch a part of the body. Corrosive acids and alkalies also cause special forms of burns by their corrosive action on the tissues. Burns may vary in degree from a mere reddening of the skin or raising of a blister to actual destruction of the underlying structures and ultimately total death of a portion of the limb. The most acutely painful burns are those in which the skin is destroyed, leaving the sensitive endings of the sensory nerves exposed to any irritating agent which comes in contact with them. A deep burn is not so intensely painful, but is dangerous on account of the shock which it causes, and of the risk of septic absorption in the body from the parts which have been destroyed. The shock following on a severe burn is the immediate cause of danger, later on the risk of septic absorption arises, but can be largely prevented by proper antiseptic precautions. A burn is dangerous from its extent on the surface rather than from its depth: it is recognised that a burn covering an area equal to one-third of the total body surface is invariably fatal. Burns of the neck and abdomen are especially dangerous.

The clothes should be removed as quickly as possible from the region of a burn. They should be cut away, and if at any point they are found to be adherent to the tissues should not be forcibly separated. Soak the adherent portions in oil, when they will gradually loosen and can be easily removed. Prevent the access of air to the raw surface by covering with flour or boracic powder, and prepare strips of gauze or clean linen soaked in oil to apply to the part. While this is being done the part may be immersed in a warm bath, at the same temperature as the body, to which some boracic powder or baking soda has been added. This will prevent the access of air, and will soothe the injured part. Any kind of oil which is available may be used, such as sweet oil, machine oil, salad oil, or the like. The most suitable is what is known as carron oil, a mixture of linseed oil and lime water in equal parts. In the absence of any kind of oil, melted fat, lard, butter, or vaseline may be used. A special form of vaseline, known as eucalyptus vaseline, is especially useful in treating burns.

These strips are to be applied so as to cover the injured surface completely: they should then be covered with cotton wool or soft clean linen, and bandaged in position. (See also p. 657.)

If there are blisters on the part they should not be broken, but covered gently and left for the doctor to deal with. If the patient is suffering from shock, he should be put to bed between warm blankets and have hot-water bottles placed round him. Stimulants should be given, some hot coffee or a little brandy. The burnt surface should not be covered by means of a single large piece of lint or linen. The advantages of using strips are two-fold: the strips will lie in closer apposition to the surface and cover it more evenly, and when it is necessary to remove them and apply fresh ones this can be done gradually, strip by strip, thus exposing only a small area to the air at a time, and so causing less shock to the patient. If the face is burnt, a piece of lint or linen should be cut out to fit the face with holes for the eyes, nose, and mouth. This is dipped in the oil and placed on the face. It is then covered with cotton wool or flannel and bandaged in position, leaving the holes for the eyes, nose, and mouth open as before.

Burns caused by corrosive acids and alkalies should be treated in the same way, having first been well washed with some substance which helps to counteract their chemical action. When the burn has been caused by an acid, it should be well washed with a weak alkaline solution made from washing or baking soda or from magnesia. A burn caused by an alkali, on the other hand, should be washed with a weak acid solution made from lime juice or vinegar. After this has been done, the affected part should be covered with the oily dressings as before.

When a person has been badly burned or scalded and it is impossible to send him to a hospital, he should be placed in a warm bath at the temperature of the body, to which some boracic powder or baking soda has been added, and a stimulant given.

Everyone should know how to deal with a person whose clothes have caught fire. Throw the person on the ground at once, on his face if it is the clothes of his back which are burning, on his back if the fire has attacked his clothes in front. This is done because the flames always rise, and are so turned away from the body. The flames must be subdued by excluding the air. Cover the patient with a rug, tablecloth, overcoat, blanket, or any such heavy substance, and roll him about in it. Get the windows and doors closed so as to prevent free access of air to the flames as far as possible. In addition to this, water may be freely thrown over the person, not only to extinguish the flames but to cool the smouldering clothes. The clothes should be removed as soon as the flames have been overcome, and the patient placed in a warm bath.

Frost Bite.—When naked parts of the body have been exposed to intense cold for a considerable period the skin becomes red and tender, but then as the process goes on becomes hard, numb, and white, and finally turns black and dies. This is commonest in cold climates in the fingers, toes, and ears. If observed in the early stages, when the skin is either reddened or pale, the part can be saved by restoring the natural heat. This is to be done by assisting the enfeebled circulation; on no account by applying warmth from outside. Were warmth to be applied to a part in such a low state of vitality it would only hasten the process of gangrene. The circulation must be stimulated by brisk rubbing with cloths dipped in cold water, or with snow till the part is again of a healthy colour. After this has been secured, warmth may be applied, the part being wrapped up in dry flannel or cotton wool. If the part has become gangrenous it will have to be removed ultimately, and should be carefully covered with pieces of lint or linen soaked in oil and protected in this way till medical assistance is obtained.

FOREIGN BODIES

By a foreign body is meant any substance which is not normally a part of the human body in which it is for the time being situated. A piece of nail may penetrate the skin and remain imbedded in the tissues, thus constituting one of a large class of foreign bodies, those found in wounds. These have been dealt with in the section relating to the treatment of wounds: it now falls to consider foreign bodies in certain special regions, such as the eye, the ear, the nose, &c.

In the Ear.—One of the most common foreign bodies found in the ear is a collection of wax. This may cause discomfort by interfering with the hearing and also by causing a tendency to vertigo or giddiness. This is due to the fact that the wax exerts pressure on the drum of the ear, and alters the normal conditions in the semicircular canals, which are the organs controlling the equilibrium of the body. Persons who suffer from attacks of giddiness, when in otherwise perfect health and for no apparent reason, should always have their ears examined, as the cause of the trouble may be there, and the remedy is simple. To examine an ear, the patient should be seated with the affected ear turned towards the light. The ear is grasped by the thumb and forefinger, the other fingers resting on the side of the head, and is pulled upwards and backwards, thus bringing the canal of the ear into view. By this means a collection of wax may be seen. The glands which secrete the wax lie towards the outer end of the canal, so that the plug of wax is usually found near the opening, unless it be of considerable size. A person with a plug of wax in his ear usually finds that the deafness caused by it is worse after bathing, when, owing to the wax becoming damp, it swells up and fills the canal of the ear. If a person complains of deafness coming on suddenly after a bath, always suspect a collection of wax in the ear. It is best always to have the wax removed by a medical man, but if this is not possible it can usually be done by means of a syringe and warm water. A syringe with a long nozzle should be used, and filled with warm water in which a little boracic acid powder may be dissolved. The ear is drawn upwards and backwards, and the nozzle is introduced

Foreign body in ear.

along the upper part of the canal, and the water directed along it. After several syringings the wax may come away; if not, do not on any account try to remove it by scraping it away. Wait until a medical man can see to it.

Other foreign bodies may be found, such as a pea or small stone. These can frequently be removed by syringing in a similar manner, or by using a piece of wire with the end bent into a loop or a small hairpin. This is inserted into the canal till it passes over the body, which is then withdrawn. It frequently happens that an insect enters the ear, and causes much unpleasantness, chiefly mental, to the unwilling host. No amount of shaking the head will avail to cause its exit, but a simple and homely expedient usually produces the desired effect. The patient should lie on one side, with the ear in which the insect is imprisoned uppermost. A few drops of warm oil are poured into the ear and allowed tc remain for some minutes, when it is usually found that the inscct will float to the surface and can be removed. Any household oil will do, such as olive oil or castor oil. There is never any urgent necessity for the immediate removal of a foreign body from the ear, so that if these measures fail, force should on no account be used, but things left as they are till attended to by a doctor.

In the Nose.—Foreign bodies in the nose are practically only found in children as the result of some prank or game. The child then comes to its mother when it finds that the body will not come out, and explains what has happened. A finger should be placed in the side of the other nostril, which is closed by pressing it against the cartilage in the middle of the nose, and the other nostril strenuously blown. Sneezing may be induced by means of snuff or pepper in the hope that the body may be removed. If these measures fail, the syringe may be used as in the case of the ear. The water should be warm and should have a little salt added to it, as pure water has an irritating effect on the tender mucous membrane of the inside of the nose. The patient must keep his mouth open, and the stream of water is sent up the clear nostril. As long as the mouth is kept open, the water will not enter into the mouth, but will return down the other nostril and may bring the body with it. As there is no immediate danger and the discomfort is probably not very great, if these measures fail there is no necessity for unduly harsh and possibly dangerous means being resorted to to get rid of the obstruction. The child can wait in safety till the doctor can be procured.

Cases also arise in which the child may be unaware that there is anything in his nose which should not be there, or is too frightened to say anything about it. In such a case the foreign body is allowed to remain and set up an inflammation and a discharge. If a child has a nasty foul-smelling discharge from one nostril, the chances are very much in favour of there being some obstruction present in it, and the nose should be examined by a doctor.

In the Eye.—A foreign body in the eye differs in many respects from those which have been considered in the nose and ear. It is only the smallest of insects, such as a very minute fly, or a small chip of stone or metal, or a particle of dust or sand which can gain entrance to the narrow space between the eyelid and the eyeball. The surface of the eyeball is particularly sensitive, so much so that the discomfort caused by a particle of dust is out of all proportion to its size. Owing to the thinness of the membrane which covers the eyeball and the number of very minute blood-vessels immediately beneath it, a small particle will very quickly cause an area of inflammation to appear, as may be seen from the bloodshot appearance of the eye. For this reason it often happens that after the offending particle has been removed the discomfort may be experienced for a short time, and only gradually passes off as the inflammation subsides. The natural thing to do on getting something in the eye is to rub the eyelids vigorously, similarly to scratching a part that itches. This is the worst thing that can be done, as it may either cause a speck of metal, which has been lying on the eyeball, to become embedded in its substance, or may break up a particle of dust into several particles, each of which is an added source of irritation. For these reasons no rubbing should be allowed. In many cases the particle of dust or eyelash may be seen lying on the surface of the eyeball between the lids or on the edges of the eyelids. It may then be removed by the moistened corner of a pocket-handkerchief. The eye and eyelids are normally moistened by the secretion of tears, normally invisible. When there is any irritation the secretion is increased and appears visible as tears. These may remove the cause of the irritation, and may be assisted by vigorously blowing the nose. If the body is not apparent, it must be sought for beneath the lids. Turn the patient to the light and pull down the lower lid by pressing downwards on the cheek with the tips of the fingers of the left hand, at the same time getting the patient to look upwards. If the particle is now visible it can be removed with the moistened tip of the corner of a handkerchief in the right hand. If not apparent, the upper eyelid must be everted and examined. To do this the patient is seated facing the light, and the operator stands behind. A thin pencil or crochet needle is held in the left hand over the upper lid, and the eyelashes are pulled upon so as to turn the lid up over the pencil. In this way the lid is everted, and, with the patient looking downwards, the under surface of the lid and the upper surface of the eyeball are exposed to view. The body is then removed as already indicated.

Foreign body in eye.

If a hard and sharp substance, such as a piece of metal or stone, has been driven into the eye with sufficient force to be embedded in it, it is useless to try to remove it by this means. All that can be done is to relieve the discomfort by placing a drop or two of castor or olive oil in the eye and waiting till the doctor comes. When particles of lime have got into the eye, special measures must be adopted to counteract the caustic properties of the lime. The eye should be washed out with warm water and lime juice or vinegar. About one part of vinegar to eight parts of water. When this has been thoroughly done, a few drops of oil should be placed in the eye and a pad, soaked in cold water, bandaged over it. Where acids have splashed into the eye or gained entrance as in vitriol-throwing, the eye should be well washed out with a solution of ordinary soda, a small teaspoonful being added to a tumbler of warm water. Some drops of oil should then be applied, and a pad bandaged on as before.

In the Throat.—Two courses are open to a foreign body in the throat: it may either pass down the gullet or may enter the windpipe. In the latter case the patient may be suffocated, and the treatment to be adopted under those circumstances will be indicated under that heading. The commonest cause of this is a particle of food going down the wrong way. Should such an object pass down the gullet, there is, of course, no need for any interference, as that is the natural path for it to take. Bodies which cause trouble in the gullet are not articles of food but some substance which should never have been in the mouth, as a coin, or needle, or a substance which, though normally fixed in the mouth, becomes loose and is swallowed, as a false tooth. Such a body may become fixed high up in the gullet at the root of the tongue, and can, in many cases, be removed by the fingers. The mouth should be kept open by the handle of a knife or a small wooden spoon and the forefinger swept round the root of the tongue from side to side. The body may thus be dislodged, or vomiting may be set up which may bring it away. If the body can be seen on looking into the back of the mouth it may be removed by grasping it between the forefingers of each hand, using them as a pair of forceps. If the body is not very large, and is causing no great inconvenience, it may be allowed to pass down into the stomach, and will, in all probability, be excreted in the motions. To favour its passage into the stomach, crusts of bread should be eaten and much water drunk, while a diet rich in whole brown bread and green vegetables will favour its progress along the bowels. It is not advisable to give purgatives to secure this end: a diet similar to the above, which will result in large copious motions, is much more likely to bring the body away with it. This treatment may be adopted when a coin is swallowed.

The motions should be carefully examined so that when the body has passed through it may be detected, and all anxiety removed. The best way to examine a motion is to mix it up in a basin or bedpan with water, so that it is broken up into small pieces, and any hard substance is readily detected. The swallowing of coins by children is apt to distress the mother considerably, but it is wonderful in how many instances the coin passes freely, and without causing any damage, through the alimentary canal. A doctor may be consulted and will be able to allay any fears. Since the introduction of X-rays it is possible to locate the position of a metallic body. Such an installation is to be found in almost every hospital, and is of the greatest value in these cases. Should a needle or pin be swallowed, it may make its way through the body without any evil consequences, but as there is always a danger of its penetrating some important organ it is well to have an X-ray photograph taken: as a result of the information so gained the doctor will be enabled to decide what steps should be taken.

An uncomfortable accident is the sticking of a fish bone in the throat. In many cases it is soon dislodged. The eating of hard food materials may help to do so—perhaps crusts of bread are as good as anything. The drinking of lime juice or vinegar is said to soften the bone and so cause its disappearance. In all cases, if these simple remedies fail, a medical man should be sent for. On no account should any attempt be made to push the body down the gullet by the finger or any instrument; such a proceeding will only make matters worse, and render the subsequent removal of greater difficulty.

Under the Skin.—Many substances may become fixed beneath the skin and cause much discomfort. The fingers and hands are the commonest positions for this to occur, and to a less extent the feet, save in children who go about bare-footed. Thorns, splinters of wood, pieces of needles and such like are the commonest. If the thorn or splinter is visible it may be easily removed by means of a clean sharp needle. The opening in the skin is enlarged by the needle, and a little manipulation will enable the splinter to be withdrawn. Should the splinter or piece of needle disappear from view, the wounded part, usually the hand, should be tightly bandaged and held above the head for five or ten minutes, to render it bloodless. A tight bandage of some nature should be applied above the wrist, to keep the hand in this condition. By means of a sharp knife or razor the hard skin about the puncture is shaved away till the end of the needle is reached, when it can be secured by a small pair of tweezers and withdrawn. If this is found to be impossible, get a doctor.

Under the Nail.—A splinter under the nail is an exceedingly painful matter, and may be removed by paring away the nail at the point of entry of the splinter till the end of it can be seized and withdrawn.

Fish Hooks, &c.—A fish hook embedded in the skin is difficult to remove owing to its barbed extremity. The same thing holds in the case of a crochet needle. Consequently it is impossible to withdraw a hook or crochet needle along the path by which it entered, as the barbed end catches on the flesh. A crochet needle may be removed by working it in such a way that the sharp point is brought out through the skin again, where it can be seized and withdrawn. If the fish hook has a small end, it may be loosened from the line and withdrawn in a similar way. If however the end is large, the barb, when brought again to the surface, should be cut off with pliers and the hook withdrawn by pulling on the end.

A Tight Ring on the Finger.—It has been metaphorically said that it is easier to get a wedding ring on the finger than to get it off again. This depends largely on what part of the world the couple live. In all countries, however, it may literally happen that a ring may be placed on the finger with comparative ease, but it is found impossible to remove it by ordinary means. The hand may be kept in a basin of very cold water for a time; this causes the blood-vessels to contract, and so reduces the size of the finger probably sufficiently to allow the ring to be removed. The finger may be well greased with soap or butter so that the ring may slip over it. A more effective method is to bandage the finger tightly from the tip downwards by a narrow strip of bandage, the end of which is passed beneath the ring. This is kept on for a few minutes and then loosened. The ring is then twisted round and round and, by pulling on the loop of the bandage which passes round it, it may be removed. The hand should be held above the head during the operation. As a last resort, a goldsmith must be employed to cut the ring.

HÆMORRHAGE

To have a clear conception of the various kinds of hæmorrhage and the reasons for them, it is necessary to understand what is meant by the circulation of the blood. The heart and blood-vessels form a continuous system through which the blood is kept constantly moving by the regular action of the heart's muscles. But the movement of the blood varies in the different vessels. At each beat or contraction of the heart the blood is driven into the arteries, along which it appears to pass in waves. The arteries split up into numerous branches, each becoming smaller till at last the blood comes to pass into the capillaries, the very minute vessels which connect the arteries and the veins. By this time the pulsation characteristic of the arteries has disappeared, and the speed of the blood has become very considerably diminished, so that in the capillaries it moves along somewhat sluggishly, as it were. The capillaries then begin to run together and form larger vessels, the veins, which, at first small, gradually increase in size owing to the coalescing of the lesser vessels. By this means the blood is returned to the heart in a more or less steady stream. There is, however, an additional change. Owing to the vital processes which are going on the blood changes colour as it proceeds on its journey. In the arteries it is bright crimson, in the capillaries light red, and in the veins dark purple. Thus we see we may have three kinds of hæmorrhage, according as the blood is arterial, venous, or capillary.

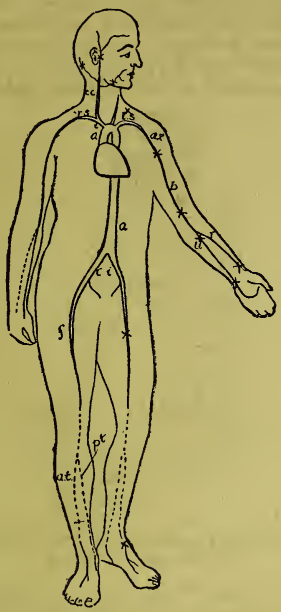
Arterial bleeding is, as a rule, the most serious of the three, and is generally easily recognised. The blood is bright crimson in colour and tends to come in spurts, the force and amount of the spurting depending on the size of the vessels which, in turn, depends very largely on the distance from the heart; blood, for instance, from a large vessel in the neck will spurt for several feet. In the case of a very deep-seated artery, as in the leg, the spurting may not be so pronounced, though the colour of the blood will indicate its nature. Venous bleeding is more of a steady stream of a much darker and more purple fluid, while capillary bleeding is of the nature of a general oozing from all parts of the cut surface.

In connection with hæmorrhage an important question arises. Is the bleeding dangerous? While it is impossible to say how much blood a person may lose with safety, some people being able to stand a much greater loss of blood than others, it is generally easy to make up one's mind whether a particular case of bleeding is likely to be of serious consequence. Bleeding from any large vessel is undoubtedly a very serious matter, depending not only on the amount of blood lost, but also on the rapidity of the loss. For both these reasons it is obvious that the bleeding should be controlled as quickly as possible. Bleeding from small cuts or abrasions is never serious, but a slight hæmorrhage becomes dangerous when it goes on for a considerable time without being controlled. It is always well to err on the safe side and prevent any greater loss of blood than is absolutely unavoidable. The results of serious hæmorrhage are seen in the state of collapse, which will be described later.

In the peculiar and fortunately rare condition known as hæmophilia, bleeding is of very serious consequence. Patients suffering from this complaint have an extraordinary tendency to bleed profusely on the slightest provocation, and such bleeding is very difficult to stop. A small cut, the pulling of a tooth, or a blow on the nose may set up a fatal hæmorrhage in a person subject to this complaint. It is peculiar also in the fact that though both the males and females of a family are hæmophilies, the children of the males escape the tendency, while the children of the females inherit it. We can do very little for the condition, but its possibility must always be borne in mind.

There are, then, the three kinds of hæmorrhage above described, any one or more than one of which may occur in a cut or wound with which we may have the opportunity of dealing. Here our knowledge of the circulation comes to our aid, but a little more detailed knowledge than has already been given is necessary. To begin with, as the bleeding in a cut is due to the escape of blood from a blood-vessel of some kind, it is obvious that the most certain method of stopping the bleeding is to close the vessel. This can be done by pressure, owing to the fact that the blood-vessels are elastic and their walls are soft. Hence the first efforts should always be in the direction of pressure on the bleeding parts. In many cases this is sufficient, as when the vessel is closed for some time the blood cannot flow along it, and the stagnant blood undergoes the process of clotting, so that the bore of the vessel becomes filled up, and when the pressure is relaxed the bleeding ceases. This process of clotting is nature's method of arresting hæmorrhage, and can be aided and hastened by means at our disposal. Certain substances have the property of helping the coagulation or clotting of blood, and are used for this purpose. In cases where large vessels are cut across it is often impossible to arrest the bleeding by pressure at the place of injury, and we attempt to do so by stopping the flow of blood in the vessels at a distance from the injured part. To do this it is necessary to know the geography, as it were, of the blood-vessels in the body, and to remember that in the arteries the blood flows away from the heart, whereas in the veins it flows towards it. Consequently to stop bleeding from a severed artery we exert pressure on the vessel between the point of severance and the heart; in the case of a vein, the pressure must be applied on the side away from the heart.

Blood-vessels.—A detailed knowledge of the blood-vessels of the body is by no means necessary in first-aid work, but a knowledge of the main vessels, especially in the limbs is of the greatest advantage and is easy of acquirement. We shall give a short indication as to where these main vessels may be found, and indicate the points at



THE MAIN ARTERIES OF THE BODY.—*a*, aorta; *i*, innominate; *rs*, right subclavian; *cc*, common carotid; *ls*, left subclavian; *ax*, axillary; *b*, brachial; *r*, radial; *u*, ulnar; *ci*, common iliacs; *f*, femoral; *at*, anterior tibial; *pt*, posterior tibial; ×, pressure points.

which pressure should be made to stop the bleeding in each part.

The blood leaves the heart by a large vessel, the aorta, which passes upwards for a few inches, then bends round and passes down on the left side of the spine to a point just below the navel. The aorta gives off various branches which supply the head and neck, the arms and the body, and ends by dividing into two arteries, which run downwards and enter the legs. Only certain branches are worthy of consideration from the present point of view. The main blood supply to the head goes by way of the carotid artery on either side. This

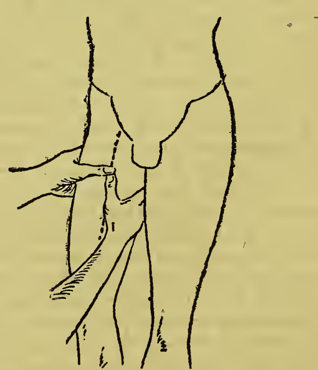
Pressure on common carotid artery.

artery runs up from the collar bone towards the angle of the jaw, and can be felt pulsating just to the side of the throat. The facial artery sends blood to the greater portion of the face, and can be felt just in front of the angle of the jaw in a notch which the finger strikes as it passes along the side of the cheek. The temporal artery passes upwards just in front of the ear, and supplies the forehead and front part of the scalp with blood. The occipital artery sends blood to the back of the head behind the ears. The subclavian artery

Pressure on subclavian artery.

is a short vessel which runs over the first rib behind the collar bone and ends in the axillary artery in the armpit where it becomes the brachial. The brachial artery runs down the inside of the arm, practically in the line of the inner seam of the sleeve to the elbow, at the bend of which it divides into two, one of which runs down towards the root of the thumb, the other to the root of the little finger. The radial artery, which runs towards the thumb, can be felt by pressing it against the radius, one of the bones of the forearm, at the wrist. It is the pulsation of this vessel which is known as the pulse. The other artery, the ulnar, lies deeper, and is not so easily felt. These two arteries supply blood to the hand and fingers, and meet in two arches in the palm of the hand. It is on this account that, as we shall see, bleeding from the palm of the hand is so dangerous, and is so difficult to stop. The arteries here may be seen in a cut to bleed from both ends. The arteries in the fingers run down to the tips along the sides of the fingers.

The two main arteries in which the aorta ends appear in the thighs about the centre of the groins, slightly to the inner sides of the middle points. The femoral artery, as it is now called, runs down



Pressure on femoral artery.

the inner side of the thigh to the back of the knee. The artery really runs down in a straight line, and the thigh bone curves round it from the front to the back. Below the knee this vessel divides into two, one part running down the front of the leg, the other running down the back. These arteries are deeply situated and cannot be felt. One ends in an artery on the front of the foot, and the other in an artery on the sole. These two supply the foot and the toes, and unite in an arch in the sole of the foot. For this reason, bleeding from a cut of the sole of the foot, as from the palm of the hand, is likely to be profuse and is not easy to stop.

These, then, are the main arteries of the body, from the point of view of first-aid work, and a knowledge of their position will enable pressure to be made at the proper places to stop bleeding from each particular place. Bleedings from the different parts of the body will be discussed individually.

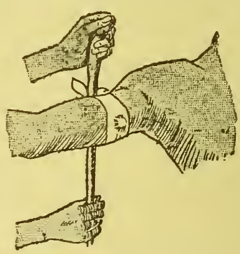
Each artery is, as a rule, accompanied by one or more veins through which the blood is brought back to the heart, so that in severe cuts involving an artery the companion vein is likely also to be injured. There is, however, a great number of veins which lie almost immediately beneath the skin, as can easily be seen on the backs of the hands, which have no arteries in relation to them. In injuries of these, the resulting bleeding is largely venous. One of the most important causes of venous bleeding is that resulting from injury to varicose veins in the legs, the treatment of which will be considered in due course. The methods employed in the first-aid treatment of hæmorrhage vary according to the nature of the bleeding. The general principles of such treatment had best be considered first.

Arterial Bleeding.—Remember always that arterial blood is bright red or scarlet, and flows or spurts from the end of the artery nearest to the heart. The first thing to be done is to stop the bleeding. This can easily be done in the cases of small cuts and wounds in the manner to be described under that heading; we are now dealing with more serious injuries in which the hæmorrhage is considerable. To begin with, then, we apply pressure in the line of the injured vessel. This may be effected temporarily by the fingers, the position in which pressure is to be made being determined by the knowledge of the situation of the main vessel which supplies the part with blood. It is clear, however, that this is only a temporary measure. Anyone who has attempted to control hæmorrhage by such digital pressure, will have realised how readily the muscles of the fingers and hand become tired under the continuous strain, and how a condition of cramp ensues.

Tourniquets.—Consequently a more permanent means of securing adequate pressure is needed. This is effected by means of what is called a tourniquet. A tourniquet is simply an apparatus which can be applied round a limb and tightened up so as to compress the vessels within it. There are several kinds of recognised tourniquets, which, if available, can be applied with ease. But in their absence it is incumbent on the attendant to provide a tourniquet on the spot. This can easily be done. The simplest form consists of a pad and bandage which can be applied directly to the wound, or in the line of the main artery. A pad can be made from an ordinary handkerchief by folding it up into a small pad, keeping one side, to be applied to the wound, as smooth as possible. A stone, cork, coin, piece of wood, or any hard substance may be placed in the centre of the pad to render it more effective. This is placed on the wound or on the artery, and a triangular bandage, folded narrow, is placed with its centre on the pad. The ends are brought round the limb and knotted as tightly as possible over the pad, so as to get the greatest pressure at the point of application. A handkerchief will, of course, do instead of a regular triangular

Pad and bandage tourniquet—(1) For brachial artery; (2) For femoral artery.

bandage, or indeed anything by which the pad may be securely fixed. A more powerful tourniquet is, however, often needed. A pad, as before, is placed on the artery at the point most suitable for applying pressure. These points will be indicated later. The pad is kept in position by a cord or strap or bandage, which is tied lightly round the limb, a piece of stick or metal rod is now passed through the loop of the bandage between it and the limb, and is turned round and round so as to tighten up the bandage by twisting it. It will be



Tourniquet—Pad and narrow bandage with stick.

found a good plan to tie the bandage on the opposite side of the limb to the pad, and to include the stick in the second turn of the knot. When sufficient pressure is obtained, the stick is secured in position by means of another bandage or by slipping one end of it beneath the bandage already applied. It is important to see that the pad is not allowed to slip off the artery during the process of tightening the bandage. During the time that this is being applied, digital pressure should be maintained at a point higher up on the artery; this may be relaxed when the tourniquet is secured. An effective tourniquet may be improvised by making use of pieces of rope, belts, braces, or such articles. These, however, are more likely to arrest the circulation in the limb completely, or to stop the venous return from without arresting the arterial flow to the parts beyond, and so cause much swelling and discomfort. In the case of a limb, part of which has been torn off, such a tourniquet of rope or elastic braces is by far the best, as here it is desirable to cut off the circulation completely.

Another very effective method of cutting off the arterial supply to the leg or forearm is known as the flexion method. As has been seen, the arteries supplying the leg and the forearm lie at the back of the knee and the front of the elbow respectively. Pressure can be exercised on them by placing a firm pad in the bend of the knee or elbow, and bending

Pad—In flexed elbow.

the leg or arm as far back as is possible over the pad so as to press it on the artery. The limb can be secured in this position by means of a narrow bandage passed round above and below the joint, and crossing over the pad to form a figure-of-eight, the ends being securely tied.

Arterial Bleeding.—The position of the patient is always of importance in cases of hæmorrhage. The patient should always be made to lie down. It is found that the heart's action is slower and more regular in this position, and consequently the blood is sent along the arteries with less force. The bleeding part should always be raised as much as possible. This diminishes the supply of blood to the part. The force of gravity plays no small part in the amount of blood which is in any part of the body. Thus in all the lowest parts there is a greater tendency for the blood to remain in the smaller vessels simply owing to its own weight. This can be seen by keeping the hand hanging down for a considerable time and then raising it as far above the head as is possible. In the former position the skin has a much warmer and ruddier hue than in the latter, where the blood, owing to the force of gravity, tends to fall towards the body. Hence the bleeding part should be elevated as far as possible without causing discomfort to the patient. Never give any stimulant to a person who has lost a lot of blood, until the hæmorrhage has been securely controlled. They increase the force of the heart's action, and in consequence increase the bleeding, to the further detriment of the patient. Keep the patient as still and quiet as possible, and do not disturb him unnecessarily. Should the tourniquet cause much discomfort or the limb beyond become swollen or cold, it is advisable to relax the pressure a little, care being taken, however, that no further loss of blood takes place. The patient may be kept comfortable by loosening the tourniquet, and then, after a short interval, tightening it again, this process being repeated at intervals.

Venous Bleeding.—Venous blood is dark red or purplish, and flows in a slow, steady stream from the side of the vessel furthest away from the heart. As the veins are in most cases situated close under the skin, and as their walls tend to come together much more than in the case of arteries, it is usually possible to stop the bleeding from them by applying pressure over the wound. This may be done by the fingers till a pad and bandage are got ready, which should be applied in the same way as was shown for arterial bleeding. If this is not sufficient to stop the bleeding, pressure should be applied to the vein on the side of the cut away from the heart. It will be found that less pressure is needed to control hæmorrhage from a vein than from an artery. The part should be raised as far as possible, as if there is less blood coming to the part through the arteries, there will be less to be taken away by the veins. The patient should, of course, be kept quiet and lying at rest. It is a good thing to see that there is no tight article of clothing impeding the flow of blood through the veins, between the point of injury and the heart. The collar may interfere in cases of cuts on the head or neck, the garter in cases of cuts on the leg, and very frequently it is found that the shoulder is constricted by the arm of the coat being too small.

In capillary bleeding, such as comes when the skin is abrased, the blood appears to ooze from the cut surface. Firm, steady pressure is all that is required to control this, or the application of cold water.

Before proceeding to discuss hæmorrhages in special situations and indicating how each should best be dealt with, it is important to emphasize a few points. Above all keep cool, and do not let the sight of blood upset you when confronted with an accident in which hæmorrhage is an important feature. Remember that the man's life may depend on your keeping cool and acting promptly. Do not waste time in inquiring what has happened; you are concerned more with the result than with the cause. Do not disturb the patient unnecessarily, and, above all, let him lie as you find him till you have arrested the bleeding. A little blood may spread over a large surface, and present a very nasty appearance, whereas, in reality, not much harm has been done as yet, and it is the part of the competent assistant to ensure that no further harm is allowed to be done. Keep a person who has lost a quantity of blood as warm as possible. Wrap him well up in overcoats or blankets. Loss of blood in any quantity is sufficiently serious in itself: when cold is added on the top of that, the dangers are increased every moment. Keep the bystanders as far away as possible to let the man have all the air he can get. The blood carries oxygen to all parts of the body from the air, and when the quantity of blood is diminished there is all the more reason for its being allowed to take up as much oxygen as it possibly can.

Hæmorrhages in Special Positions.—*The Scalp.*—Bleeding from the scalp is usually fairly free, and presents a much more serious appearance than is really the case. Children especially are liable to wounds in this region, and come rushing in for help with a large area of the head covered with clotted blood. This apparently serious state of affairs is due to the fact that when the blood comes in contact with the hair it clots very readily, and so remains there, the quantity increasing with the time allowed to elapse before the bleeding is controlled. The controlling of such bleeding is, fortunately, a very easy matter. The hard skull presents everywhere a splendid surface against which the injured vessels may be compressed. As a rule all that is required is to tie a narrow bandage firmly round the head, as already shown, with the knot over the bandage on the bleeding point, so as to exert the maximum pressure there. In cases of bleeding from the front of the scalp pressure may be made on the temporal artery, just in front of the ear on the injured side, or it may be necessary to apply pressure on both sides, as the arteries on either side communicate freely over the forehead. When the cut is on the back of the head, pressure may be applied to the occipital artery by placing the hand flat on the back of the head with the fingers on the crown and pressing firmly with the thumb extended towards the ear. In most cases, however, the bandage, either alone or with a pad, will be found quite sufficient to control the hæmorrhage.

The Face.—Bleeding from wounds of the face may be controlled by digital pressure on the facial artery at a point just before the angle of the jaw. The finger presses the artery against the jaw bone. Bleeding from a cut on the cheek may be controlled by placing a small pad over the cut and holding it firmly in position with the fingers while the thumb, passed into the inside of the mouth, presses firmly against them.

The Nose.—Bleeding from the nose may be due to a variety of causes, or may apparently have no cause at all. The blood is either venous or capillary, and is usually a mixture of both. The severity of the bleeding varies considerably, and may require very energetic treatment in some cases, whereas in others it can quite well be left alone, as it is not infrequently Nature's method of getting rid of the superfluous blood in the body. This latter is often the case in young, healthy children, and in strong, full-blooded adults, in whose cases the loss of a little blood is a matter of no consequence. Cases in which the bleeding is fairly free for a period, and then tends to cease of its own accord, may be left alone : there are cases, however, in which the bleeding is but a symptom of some general disease of the body. Here the bleeding from the nose may be a very valuable indication, as, owing to its persistence, it leads to the detection of some ailment hitherto unsuspected. In these cases the bleeding is not so marked as in the cases due to a blow on the nose or head; it is rather a more or less continuous dribbling, relieved by short periods of cessation, and marked by intervals of greater activity. In such cases a medical man should be consulted, and a thorough examination of the patient made. Frequently recurring slight bleedings in children should lead to having the nose examined, as some foreign body impacted in the nose may be the exciting cause.

When a person's nose bleeds, he usually stands with his head over a basin, into which the blood is allowed to flow. This should on no account be allowed. Place the patient in a chair before an open window with a large towel tied round the neck to act as a bib (this will prevent the blood soiling the clothes), and with his feet in a tub of hot water. Keep the head well back so that the nose is the highest point—the principle to be aimed at in all cases of bleeding. Make him keep his mouth, open so as not to breathe through the nose. Loosen the collar and shirt, and in the case of women open the corsets, so that full opportunity may be given to the blood from the head to return by way of the veins to the heart. By raising the arms well above the head the chest is expanded, and owing to the increased tension on the chest the blood is sucked back more forcibly. The bleeding is usually found to come from one nostril, and it may in many cases be controlled by simply pressing the side of the nose on the bleeding side against the central part of the nose. The application of a sponge soaked in cold water to the nose is often efficacious. A little vinegar may be added to the water, or a little powdered alum may be dissolved in it. The application of cold to the back of the neck, either by means of a cloth wrung out of cold water or a piece of metal—a door key, for instance—does good by causing the blood-vessels to contract, and so diminishing the supply of blood to the nose. If a syringe is at hand some of the alum solution may be injected up the nostrils; this is not a pleasant proceeding, but in many cases acts like a charm. A useful remedy, which is available in every house, is turpentine. The vapour of turpentine is inhaled up the nostrils by filling a jug or bowl with boiling water to which a tablespoonful of turpentine is added. The jug is held close to the patient's nose, and it as well as the head is covered in with a towel, so that the steam and vapour of the turpentine are inhaled. As the water cools, the vapour ceases to be given off, and more boiling water is requisitioned

If all these means fail recourse must be had to plugging the nostril. This is done in two ways, either from the outside or from the mouth. It is advisable to have it done by a medical man, but in severe cases the nostril may be plugged from the outside by anyone. The best method is to take a long strip of narrow lint or clean linen from a foot and a half to two feet in length. This may be soaked in the alum solution or in a weak solution of vinegar. With a thin penholder or similar rod the strip is gradually pushed into the nostril and packed on itself till the nostril is completely filled up. The end must be left hanging out so that it can easily be removed. It may be kept out of the way by being held up by a thread passing round the ear. On no account must small strips of cloth be used: it is very difficult to remove them, and a portion may easily be left behind. If no strip is available, the corner of a handkerchief may be folded or rolled up into a cone and kept in position by a bandage round the head. No plug should be allowed to remain in the nose for more than twelve hours, as it gets foul and evil smelling if left for a longer time. If necessary a new plug of clean material may be inserted at the end of this time, when the original one has been removed. The removal is rendered easier by soaking the plug in a weak antiseptic solution, or the solution of turpentine, which softens it.

If the bleeding cannot be stopped by any of these means, a medical man must be called in, who will be able to carry out any further treatment which is necessary.

The Mouth.—Bleeding from the mouth may be due to a local cause, such as an abrasion of the gums or cheeks, or to a more distant one. We are here concerned with the bleeding due to some local injury. Place the patient in a good light and get him to wash out his mouth with clean water. A careful examination of the interior of the mouth will enable the bleeding point to be seen. A small pad of lint or clean linen is soaked in a solution of alum or any styptic at hand, such as hazeline, and is kept firmly pressed against the bleeding point by means of the fingers. If the injury is near the lips, firm pressure may be made beyond it on the side away from the lips; in this way the blood-vessels supplying the part may be compressed.

In cases of bleeding in the mouth we can also make use of the fact that both heat and cold are useful in stopping hæmorrhage. The cold requires to be as nearly that of ice as is possible, and the heat must be as great as the patient can stand. Where either of these methods has to be continued for any length of time, it is better to choose the application of heat rather than of cold, as there is more risk of danger in the latter. We may control bleeding in the mouth by giving the patient ice to suck or making him retain a mouthful of the coldest water that can be got, or, if heat is desired, a mouthful of the hottest water he can bear.

If the bleeding is from the tongue it may be controlled by pressing a pad of lint or linen soaked, as before, in the alum or turpentine solutions, firmly on to the tongue and retaining it in position by means of the fingers and thumbs.

Copious bleeding may require pressure to be made on the carotid artery, which is best done by placing the fingers on the back of the neck with the thumb downwards and pressing the artery backwards on to the spinal column just to the side of the throat at the level of the Adam's apple.

The Socket of a Tooth.—There is always more or less hæmorrhage from the socket after a tooth has been extracted, and it is a matter of difficulty to settle how much is normal and how much is abnormal. In the great majority of cases of people in good health the bleeding stops of its own accord after a varying interval. When it becomes really troublesome it is probably in a person who is in a very weak state or who suffers from one or other of certain diseases. The bleeding usually comes from the divided end or ends of the vessels which supplied blood to the tooth, and is then not at all dangerous. The serious cases are those in which the blood wells up from the whole gum and whole exposed surface of the socket. In this case the socket must be firmly plugged. As the object of the plugging is to exert pressure on the bleeding spots it must be done very thoroughly, so as to fill the socket completely. The plugging must reach down to the very bottom of the socket. If too large a piece is put in at the beginning it fails to reach the bottom, and the bleeding continues unchecked. Use a very narrow strip of lint or cotton wool, which may be soaked in the turpentine or alum solution, and with a fine rod, such as a crochet needle, press the lint down firmly to the bottom. Gradually press in more and more of the lint till the cavity is completely filled up. It is advisable to fill up the space between the adjacent teeth on either side, so that when the mouth is closed the corresponding tooth of the other jaw will help to keep the plug in position and to increase the pressure. The jaws may be kept in contact by means of a four-tailed bandage.

The Ear.—Bleeding from cuts of the ear itself may be arrested by pressure applied by the fingers and thumb or by means of a pad of lint or linen soaked in the alum solution. It is never very serious, and can be controlled with ease. Bleeding from the inside of the ear is a more serious matter, especially if the patient has had a fall on the head, in which case it may be due to a fracture of the skull. No attempt should be made to plug the ear on any condition; the blood should be wiped away as it appears and the ear kept clean. A pad of clean absorbent wool may be lightly applied on the ear for this purpose, till the patient is examined by a medical man.

Cuts while Shaving.—Cuts by the razor when shaving, though not serious, are unsightly, and may bleed fairly freely. The bleeding can be stopped by pressure with a wash rag soaked in boiling water to which some alum has been added. The abrasions of the skin, which can hardly be called cuts, to which some people seem specially liable, bleed out of all proportion to their importance. A little tuft of cotton wool placed on the spot and allowed to remain for a few minutes, together with the free access of fresh air, is all that is necessary to arrest the hæmorrhage.

The Neck.—Bleeding from wounds of the neck may be very serious, on account of the large vessels, both arteries and veins, which pass through that region. The carotid artery is the vessel which governs the chief blood supply, and it can be compressed below the seat of injury by pressing the thumb well back towards the spinal column at the side of the throat as already shown.

Cut Throat.—While it is unfortunately true that the great majority of cases of cut throat—whether suicidal or homicidal—prove rapidly fatal, cases are met with in which assistance immediately and intelligently given has been able to preserve life. In such cases the damage done, whether for reasons of temerity or otherwise, has not been sufficiently extensive to attain the desired object, and it is frequently found that the injury is largely confined to one side of the neck, the other escaping comparatively lightly. In such a case the carotid artery must be compressed below the seat of injury with as much dispatch as possible, in the manner already shown, while it is also necessary to compress the vessels above the cut as well. This is done for two reasons. Owing to the free communications between the terminal branches of the carotid arteries on both sides and other vessels, there is likely to be considerable bleeding from the upper end of the divided artery. There may also be considerable bleeding from the upper end of the cut jugular vein, which runs down the neck in close relationship to the artery. This bleeding may be controlled by the thumb of the other hand, placed above the hand already in position, and exerting pressure in a similar direction. As it may be a considerable time before the medical man arrives to take charge of the case, the muscles of the thumb and hand are very likely to become tired and cramped. Other helpers should be secured, and the pressure maintained by one relieving another till assistance is secured. As a good deal of blood may be lost in the process of changing—a loss which the patient, with his already depleted circulation, is likely to find too much—this may be prevented by getting each new assistant in turn, when the hands of the original assistant are tired, to place his thumbs over the thumbs of the former, which are kept in position on the vessels. The second assistant now exerts the pressure, the first assistant allowing his thumbs to act as passive pads, without making any strain whatever. In this way his tired muscles are allowed to rest while the pressure is being kept up by the second assistant. When the latter is tired, the former is probably rested. and can continue the pressure once more till he again feels the strain. In this way continuous pressure may be maintained by only two attendants. More, of course, can be made use of, if available.

During all this time the patient is kept lying on his back and as quiet as possible. Means should be taken to keep the patient as warm as possible with rugs, coats, &c., and free access of air should be secured.

In certain cases of cut throat—probably homicidal rather than suicidal—the wound is so low down in the neck that it is not possible to compress the carotid artery. In this case, the subclavian or the innominate artery must be compressed on the first rib. This is done by pressing the thumb firmly downwards and backwards at the angle where the breast bone meets the collar bone at the lowest point of the neck. This requires a considerable amount of pressure, and may be done most easily by sitting at the other side of the patient's head from the injured side and passing the arm round over the head.

The Armpit.—Bleeding in the armpit may be due to accidents such as falling on the spikes of a railing, one of which penetrates the arm, or to having the whole arm torn out of its socket by machinery. The hæmorrhage here is very severe, and must be arrested at once. It proceeds largely from the axillary artery. The torn or cut end of this may be visible, and it may be possible to control the hæmorrhage by direct pressure by the fingers on the vessel. Failing this, the subclavian artery must be pressed against the first rib. There is not the same necessity for exerting the pressure so close to the middle line of the body as in the last case, and it is consequently an easier matter to do so. Stand at the same side of the patient, who is best sitting up, if possible, if the loss of blood has not been very great, and place the hand—the left hand for the right side, the right hand for the left—over his shoulder with the fingers down over the shoulder blade and pointing to the spinal column. The thumb then lies on the front of the shoulder, with its outer border lying against the upper edge of the collar bone. Now press the thumb firmly downwards and backwards on to the first rib, and the artery will be compressed as it passes over the rib. The procedure will be rendered easier if the patient's injured shoulder is kept well forward and his head is turned away towards the sound side. The thumb may be assisted by the thumb of the other hand pressing above it, the hand lying on the front of the chest, and the fingers passing round the side of the neck.

The Upper Arm.—The main vessel in the upper arm is the brachial artery, which is the continuation of the axillary. As we have seen, it runs down the inner side of the arm, closely corresponding to the seam of the coat. Hæmorrhage in the arm high up is best arrested by compressing the axillary artery. This can be done by means of a pad and bandage. Roll up a firm pad of cloth, with some hard substance, as a stone, inside it to about the size of a cricket ball and place it well into the armpit with the arm stretched out. Bring the arm close to the side and pass a narrow bandage below the pad. Bring the ends of the bandage up in front and behind, pull them as tightly as possible, cross them over the top of the shoulder, and tie the ends round the body, beneath the arm on the opposite side. During this proceeding make sure that the pad does not slip. Keep the arm close to the side and bring the forearm across the chest, in which position it is secured firmly by a bandage passing round it and the body.

In the case of an injury lower down the arm, we may compress the brachial artery. This may be done digitally or by means of a tourniquet. Stand behind the patient and get him to hold the arm straight out from the side with the palm of the hand uppermost. Pass the hand underneath the arm above the point of injury, and press the fingers firmly against the bone. The artery can be felt beating by the fingers, and so its position is secured. While this is being done a pad and bandage tourniquet should be prepared and applied as has been shown, the pad being carefully placed on the line of the artery.

The Forearm.—In the forearm, the two arteries into which the brachial divides are deeply placed for part of their courses, in consequence of which it is impossible to apply digital pressure. The best method of stopping hæmorrhage in this region is by compressing the brachial artery at the elbow. A firm pad is made or the sleeve of the coat is rolled up so as to form a pad at the bend of the elbow. The forearm is bent on the upper arm, and is kept in this position by means of a narrow bandage which makes a figure-of-eight loop round the fore and upper arms. The arm is then kept at rest in this position by means of a sling bandage. This will be found to be an excellent method of controlling the hæmorrhage at the wrist in such injuries as arise from the bursting of a bottle when the cork is being drawn, and similar accidents.

The Palm of the Hand.—The ulnar and radial arteries pass down the sides of the forearm and enter the hand. Here they divide into branches and unite to form two arterial arches in the palm. On account of the numerous branches, and of the way these are involved in the firm connective tissue of the palm, it is difficult to control hæmorrhage in this region by pressure on the injured vessels. In some cases this may succeed. A firm pad is placed in the palm and the fingers are tightly bandaged over it in the manner which has been shown. The forearm is then passed across the chest so that the bandaged hand lies on the opposite shoulder, in which position it is secured by a bandage round the body.

We may also compress the ulnar and brachial arteries at the wrist. The position of the radial is easily found close to the root of the thumb by feeling the pulse in it. The ulnar pulse may also be found in a corresponding position on the little-finger side of the wrist. Make two small pads—pieces of lead pencil, halves of corks, penknives, &c.—and lay one in position on each vessel and bandage as tightly as possible over them. The arm should then be bandaged across the chest as already indicated. It will probably be found that the simplest and most effective method to control bleeding in the palm is to compress the brachial artery at the elbow by the flexion method as shown already.

The Fingers.—Serious hæmorrhage from a finger, as when a portion has been chopped off by a sharp instrument, may be arrested by tying a string or elastic tourniquet round the stump, and bandaging the arm across the chest with the hand at the opposite shoulder. There is not likely to be much hæmorrhage when a finger or portion of the arm has been crushed by a heavy weight, as then the arteries are torn across, and do not bleed so much as when they are cut by a sharp instrument.

The Thigh.—The main artery which supplies blood to the thigh is called the femoral, and runs down from the groin, keeping to the inner side of the thigh, to end at the middle of the back of the knee by dividing into the two arteries of the leg. Digital pressure may be made in the artery high up in its course. The patient should be lying on his back, and the assistant sits or kneels at the side of the injured limb, facing towards the patient's head. To get the right spot at which to apply pressure lift up the leg, and the fold made by the trousers on the front of the thigh gives the required point. The leg should be kept in this position by letting it rest on an overturned chair which lies on the edge of the seat and on the back. Place one hand—the right in the case of the right limb, the left in the case of the left—on the inner side of the thigh with the fingers passing upwards to the back and the thumb extended across the front, the pad of the latter lying on the fold of the trousers. The other hand lies on the outer side and front of the thigh with the thumb pressing on the thumb of the first. By pressing firmly against the thigh bone the artery is compressed and the bleeding controlled. The thumbs may be used alternately to exert the pressure, without, however, removing the underneath one. When it gets tired, the second thumb presses on it and allows it to rest passively as a pad till such time as it is sufficiently rested to exert the pressure again. As the hæmorrhage in accidents to the thigh is serious, no time should be lost in arresting it; the pressure can quite effectively be made without disturbing the clothing.

In those very serious cases where the leg is torn off very high up it may not be possible to compress the artery by this method. Here the actual bleeding point may be seen and secured firmly with the fingers, all considerations being secondary to that of controlling the bleeding. It may be necessary to try to control the bleeding even higher up. This is done by pressing on the aorta itself. While this is at the best of times no easy matter, it is rendered especially difficult if the patient be a fat, heavy person. Still it may have to be attempted, and has in many cases prevented a patient's bleeding to death. Kneel at the side of the patient, preferably the left side. If the patient can be placed in such a position that the whole body is inclined downwards towards the head it is considerably easier. Close the left fist and plant it firmly on the wall of the abdomen just below and to the left of the navel. Keeping the arm as straight as possible, allow the whole weight of the body, or as much of it as is possible, to rest on the closed fist, which is thus pressed on over the aorta on to the patient's back. There is less likelihood of the arm getting rapidly tired if it is kept straight without bending the elbow, and greater pressure can in this way be brought to bear on the artery. Consequently the kneeling position is better than sitting down by the patient's side. Two assistants, one on either side, can relieve one another, and maintain the pressure till medical assistance arrives. In cases of wounds or accidents lower down the thigh, as when a leg has been torn off and it is desired to stop the circulation completely, a tourniquet should be applied by means of a pad and bandage—the pad being placed over the line of the artery—or by means of a few turns of a rope, belt, or elastic band. This is the simplest and best thing to do when a limb has been cut off, say, by the passing over it of a railway train.

The Leg.—The arteries in the leg are deeply placed, and are not easily available for compression. Here it is necessary either to compress the femoral artery as indicated or to stop the circulation in the leg by the flexion method at the knee joint. A firm pad is made, about the size of a tennis ball, and placed in the hollow at the back of the knee joint. The leg is bent back on the thigh as far as possible, so as to press the pad firmly against the bone, the artery lying between the two, and a figure-of-eight loop round the leg and thigh keeps the limb in position. The thigh should then be bent up on the abdomen.

The Sole of the Foot.—Hæmorrhage in the sole of the foot is usually copious and hard to deal with locally, just as, and for the same reasons as, in the palm of the hand. The application of a pad and a light bandage may suffice, but it will usually be necessary to adopt one or other of the methods described of compressing the femoral artery in the thigh or at the knee. Digital pressure may be made on the plantar arteries in the middle line of the ankle in front or half way between the inner bone of the ankle and the tip of the heel. This, however, is not very efficacious.

Varicose Veins.—This is a condition found chiefly in the veins of the legs, which become enlarged and twisted, and as a result the vessels become weaker. It is usually found in people whose occupation entails a considerable amount of standing in an upright position, and is undoubtedly helped by the wearing of too tight garters or sock suspenders. Varicose veins in themselves do not give rise to hæmorrhage: they cause a feeling of discomfort in the legs, and the patient gets easily tired. The return of the blood from the feet is interfered with, and the blood tends further to dilate the weakened vessels. On this account the tissues in the neighbourhood of the veins get into a state of low vitality, and if any injury takes place, there is very little prospect of the usual speedy recovery which occurs in a healthy part. Such legs are also liable to break out into ulcers which may invade the veins. This may happen slowly and insidiously, so that the patient whose veins are varicose may be unaware of any further complication till the blood is felt trickling down the legs or filling the boot. The hæmorrhage may vary in amount according to the size of the vein, but is usually continuous, and though it may present an alarming appearance it is, fortunately, one of the easiest of hæmorrhages to deal with. The patient should be laid on his back and the leg raised and supported on the back of a chair turned so as to lie on the edge of the seat and on the back. Any constriction formed by the clothing around the limb should be removed, so as not to interfere with the venous return. In a great number of cases this will be all that is necessary to stop the hæmorrhage, and the relief to the mind of the patient at this simple expedient is very great. Further aid consists in securing a pad by means of a narrow bandage over the bleeding point. It may be necessary to apply pressure by means of a bandage not only below the wound, on the side away from the heart, but also on the side nearest the heart, as such veins frequently bleed from both ends owing to their distended condition and the inefficient state to which the valves, which normally prevent any return flow of the blood, are in consequence reduced. It will be found of much help to apply a bandage firmly but never too tightly round the leg from the toes up to beyond the seat of injury. This not only helps to lessen the supply of blood to the limb, but by making the blood return more by way of the deeper veins, secures a smaller stream passing along the more superficial and varicose vessels.

Internal Hæmorrhage.—This term is used to imply hæmorrhage from the blood-vessels which does not appear outside the body, being confined in some region of the body, such as the chest or abdomen. It may also include hæmorrhages from the lungs and stomach, which, though internal in their origin, make their appearances by the mouth. As a typical case of internal hæmorrhage we may instance a man over whose body the wheel of a heavy cart or waggon has passed. There may be very little evidence of injury to be found on external examination of the patient, but his condition leaves no doubt that something is seriously wrong; in a great number of cases some organ in his abdomen has been ruptured and is bleeding freely. The symptoms presented by such a case are usually clear and distinct, and such as call for immediate attention. They are due in large measure to lack of blood-supply to the brain. The patient becomes weak and faint, there is much giddiness and a feeling of sickness, buzzing noises are heard in the ears, the sight becomes dim, and the patient may become unconscious. The face and lips become pale, the patient yawns and sighs, the breathing is difficult, and the patient throws his arms and legs about as though struggling for air. This so-called "air-hunger" is very typical of a severe hæmorrhage of any kind. The pulse as felt at the wrist may become very small and may not be perceptible at all. The patient is clearly in a very serious condition, and medical assistance should be obtained with no loss of time. In the meantime much may be done to preserve the flickering life of the person. There are three objects to be desired in treating such a case. In the first place any further loss of blood should be prevented. It has been seen how easy a matter this is to effect in cases of bleeding from a wound where it is known from what source the bleeding comes. Here, however, we do not know the exact source of the bleeding: all that we can do is, by keeping the patient extremely quiet, to allow the heart to do its work as quietly as possible, and prevent the force of its action being increased in any way. Keep the patient at rest on his back, and open up all the clothes to prevent any resistance to the circulation. Let him have as much air as possible, and allow no one to come near. Secondly, the circulation must be kept quiet. This is effected by the means which have already been adopted to prevent further loss of blood. The two are intimately related. In the third place, the blood-supply to the brain must be maintained. The vital functions of the body are maintained and controlled by nerve centres in the brain, and the proper performance of these functions, indispensable as they are to the life of the individual, depends on the blood-supply of the brain. This is secured by so placing the patient that his head is the lowest point, in which case the blood available for the circulation tends to gravitate towards the head. By lessening the total volume of the space which this blood has to fill, it may be sent in greater abundance to the part that is left. The arms and legs may be bandaged from the fingers and toes upwards as tightly as is possible, preferably by means of elastic bandages. These may not be available, and in their absence ordinary bandages should be used. By this means the limbs are rendered almost bloodless, and a greater quantity of blood is available for the supply of the vital centres. This last expedient is adopted when the patient's condition is critical. His hope of safety lies in immediate surgical attention, so that no time must be lost in securing such.

Hæmorrhage from the Lungs.—Hæmorrhage from the lungs may occur suddenly and be of an alarming nature, but it is usually not so serious as to be fatal. In most cases the patient is aware of the fact that he is the subject of some pulmonary affection. Blood from the mouth may come from the mouth or throat itself, from the lungs, or from the stomach. The first of these has been considered. Bleeding from the lungs has several features which enable it to be distinguished from bleeding from the stomach. The patient experiences a sensation of tickling in the throat, and has a desire to cough. He coughs, and is surprised to find that blood comes up in greater or less quantity. The blood is bright red and is mixed with the spit. It is also frothy and full of bubbles of air. The patient should be put to bed, and the head and shoulders propped up by pillows. The clothes should be loosened about the neck and chest. Cloths wrung out of cold water should be applied to the chest, and ice given the patient to suck. The vapour of turpentine should be inhaled from a jug containing boiling water to which a quantity of turpentine has been added. Keep the patient as quiet as possible, special care being taken to prevent movements of the arms. Get a doctor as quickly as possible.

Hæmorrhage from the Stomach.—In this case the blood is vomited, the patient having a sensation of sickness. The blood is dark in colour, and appears in small clots, which may be mixed with particles of food. The blood and food may be so mixed up as to present the appearance of coffee grounds. Get the patient to bed and kept as quiet as possible, till the doctor arrives. Place cloths wrung out of cold water or pieces of ice in an icebag over the stomach region at the lowest part of the breast bone, and on no account give the patient any food. Some ice may be given to suck.

Bleeding from the Rectum.—This may be due to various causes, some of which are local, as piles, the passage of a hard, sharp body in the motion, or an injury of some kind. Other causes are to be found higher up in the intestinal canal, and may be symptoms of serious disease. An attack of piles may cause much pain and some bleeding. The piles may be covered with an ointment and pushed back into place. Cold water should be applied by means of cloths, or small pieces of ice may be inserted. The motions should be kept soft by some opening medicine each morning, and the bleeding will soon cease. Medical advice should be taken as to the condition, especially in old people.

Cuts and Wounds.—Wounds are divided into various classes, according to their nature, and though there are special methods of dealing with each type, the general principles underlying the treatment are the same in all cases. In the first place, the bleeding must be controlled. In minor injuries this is usually an easy matter, as will be seen, while the foregoing sections have indicated how this is to be secured in cases where the bleeding is serious. Next the wound must be rendered clean and free from all extraneous substances, such as dirt, pieces of clothing or hair, &c. People's conceptions of cleanliness vary, but no one is so strict in the interpretation of the term as the surgeon. A clean wound to him is not merely a wound in which nothing in the nature of a substance foreign to the tissues can be seen: it is in addition a wound in which there are present no bacteria or micro-organisms which would hinder the natural process of healing. It should be the aim of anyone who is called to render aid in the case of a wound to secure this standard of cleanliness as far as possible. For this purpose substances known as antiseptics are employed in solutions to wash the wound.

There are many substances of this nature, but the amateur will probably be limited in his choice. A weak solution of Condy's Fluid, or a solution made by dissolving some crystals of permanganate of potash in boiling water, is one that can usually be obtained. In most households there is kept a bottle of some proprietary antiseptic or disinfectant such as Izol, Kerol, or the like; a weak solution of any of these does admirably. The strength of the solutions are given on the labels of the bottles.

The wound should be well washed with the antiseptic solution, so as to remove any particles of dirt or any other substances which have been present. If this does not suffice to clean the wound, anything which is still left must be removed by a pair of small tweezers or by any means which suggests itself. If anything is left behind in the wound it will act as a hindrance to the union which takes place between the cut surfaces by the natural process of repair.

The parts which have been disturbed must also be got back as near to their original positions as possible and retained there. This is a most important point. In the case of a simple cut the edges should be pressed together for a short time; this will help to stop any bleeding, but it is of much greater importance in being the condition necessary to promote union in the most favourable way. In wounds where some portion of the tissues have been removed it is not possible to bring the edges together, nor would this be the natural position. Here a different mode of procedure is necessary, as will be seen. The last point to be attended to is to secure rest to the injured part, so that the natural processes may go on unimpaired. This is, as a rule, easily secured. Many cases merely require the application of a bandage: in others, especially where the wound is near a joint, it may be necessary to restrict movement in the part by applying a splint. Care must be taken not to tie the bandage so tightly as to interfere with the circulation. The better circulation there is in the injured part, the quicker will healing take place

Incised Wounds.—An incised wound is one in which the parts are cleanly cut by a sharp instrument such as a knife or a razor. In such a case, apart from the actual cutting of the tissues, there is no other injury done to them. These wounds may vary from a simple cut of the finger to the dreadful injuries caused, say, by an insane person with a carving-knife or razor. Slight cuts require very little in the way of treatment. They should be well washed by a tepid solution of some antiseptic, the water used for this purpose having been previously boiled and allowed to cool. The water should be allowed to pour on to the part freely from one vessel, and may be prevented from making a mess by being collected in another vessel below the part. It may be wrung out of a clean sponge or pad of linen. When the cut has been cleaned in this way the edges should be firmly pressed together and kept in this position by a small dressing of lint covered by a bandage or by means of some antiseptic adhesive plaster. Any of the plasters to be had in the chemists' shops answer the purpose admirably, and are usually applied by slightly heating them. The plaster should be cut in narrow strips of sufficient length to get a firm hold on the surface. Not only must the edges be kept well together, the sides of the wound down to the bottom should be kept in contact. This is secured by having the strips long enough to exert pressure through the flesh around the wound down to its deepest part. Apply the plaster at right angles to the cut, leaving a small space between each strip and taking care to leave a portion of the cut uncovered at its lowest part. This is a precaution in case the wound does not heal by the method known as first intention, but goes on to the formation of matter, which must be allowed to escape as soon as it forms. If it is not allowed a ready means of exit it will force its way into the tissues and cause damage as well as pain. In applying a strip of plaster begin by affixing one end at a suitable distance from the cut and press it closely to the skin up to the cut itself. The edges are then pressed well together and the remainder of the strip secured in position. By this means the parts are kept in close contact. This is quite sufficient in cuts which do not extend very deeply into the tissues. Where the injury is fairly deep, affecting the muscles as well as the skin and fat, more pressure will be needed. This is got by applying a few layers of lint over the plaster and a firm bandage. If there is no pain or heat in the wound this may be left for a day or two: if, however, there is any evidence of suppuration or the presence of matter the dressing must be removed, the wound washed clean with the antiseptic solution, and dressed as before. It is important in removing the plaster strips to remove each end up to the cut, so as to avoid pulling the edges asunder and so destroying any healing which may have taken place. It is also a good plan to apply each new strip in the place of that removed before the next strip has been taken off. This will help to prevent the wound opening. Where a wound goes on to the formation of matter, the dressing should be changed twice each day, new pieces of lint being applied to absorb the discharge, and the wound well flushed with the antiseptic solution. Do not, on any account, strive to clean away the matter by rubbing; a good flushing will always remove it without interfering in any way with the healing.

Contused and Lacerated Wounds.—In a contused or lacerated wound there is, in addition to the abrasion of the skin, more or less bruising or tearing of the surrounding parts. This bruising may be only of a very slight degree, or it may be so great as to result in the actual destruction not only of the more superficial but even of the deeper tissues. These wounds are produced by crushing or tearing, as in machinery accidents or the bites of animals. The hæmorrhage here is not so free as in the cases of clean-cut wounds in which the vessels are divided cleanly by the cutting instrument and the blood is allowed a free and ready means of escape. Here such vessels as are affected are rather torn or bruised, with the result that their coats are squeezed together and tend to adhere, thus preventing any serious hæmorrhage. Such hæmorrhage as there is, is more of the nature of blood squeezed out from the smaller vessels into the tissues, and is limited in amount. It has been seen that the great risk in an incised wound is the danger of death from the severe hæmorrhage, owing to some large vessels having been cut across: in contused and lacerated wounds the danger is not so immediate, and can be avoided by proper antiseptic treatment. The risk of infection of the wound, either from the instrument which has caused the accident or as the result of the local death of parts of the tissues, can be satisfactorily reduced to a minimum. The former is averted by a thorough cleansing with an antiseptic solution, by dressing the wound with antiseptic dressings, and allowing any discharge from the wound to be absorbed by the dressing. To prevent any danger arising from the presence and subsequent putrefaction of any dead parts, care must be taken to allow these to slough off freely, and to be washed away by thorough flushing of the wound.

Healing in wounds of this nature is usually a slower process than the healing by first intention which has been seen to occur in simple incised wounds. Owing to the loss of tissue in the neighbourhood of the wound it is impossible to bring the edges and surfaces into apposition. The space so left becomes filled with blood-clot, in which certain changes occur which result in the formation of new tissue, known as scar tissue. This gradually becomes organised into tissue corresponding very closely to that which it is replacing, and is covered by an extension over it of the skin growing in from the edges of the wound. When healing is complete there is left a scar to mark the situation of the wound, the skin over the scar area differing from the true skin in having neither hair follicles nor sweat glands.

In treating such a wound the greatest care must be exercised to secure surgical cleanliness. The wound must be thoroughly flushed with an antiseptic solution—any of those already indicated will suit admirably—and pieces of lint or gauze soaked in the solution must be applied as dressings, and secured in position by means of a bandage. Any foreign bodies such as splinters, pieces of dirt, or clothing must be removed, and any portions of skin or tissue which are almost separated should be removed with a sharp knife or a pair of scissors. The dressing should be changed twice a day, and the wound well washed. Rest should be secured to the part by means of splints and bandages.

Punctured Wounds.—These are probably the most common of all wounds met with in ordinary life, and range from the simple running in of a needle or thorn to the stab of a dagger or the spike of a paling. If the instrument causing the wound is a sharp, clean one, the resulting wound is in many ways the same as an incised one; if it be rounded or rough, the edges are more or less lacerated or contused. As such a wound extends deeply into the part, the real injury is greater than is at first apparent, the opening in the skin being usually but a small portion of the fatal damage. The danger of such a wound lies in the risk of damage to large vessels deep down in the part, and of entering some important cavity of the body or some vital organ. There is also the risk of septic infection, which, however, can be largely prevented by suitable precautions. The danger is not so much proportionate to the extent of the wound as to its nature and the cause of it.

In simple cases, as of thorns or needles entering the hand or foot, the wound may heal by first intention, when the instrument causing it has been withdrawn and the part thoroughly cleansed with an antiseptic. In the severer cases, where the parts have been severely bruised or lacerated, healing usually takes place by granulations or scar tissue. The principles of treatment are the same as in the cases already mentioned. Remove the foreign bodies from the wound, render it as surgically clean as possible, and keep the bandaged part at rest. In favourable cases the wound heals cleanly and satisfactorily, without any pain or discomfort.

It will occasionally happen, however, that the wound becomes inflamed and red, the parts surrounding it are hot and swollen, there is much pain and tenderness on pressure. These are signs that suppuration has occurred in the wound, and that matter is forming owing to the presence of some infective material which has been left behind, probably deep down in the tissues where it was impossible to get at it. If no medical help is available the assistant must open up the wound himself by means of a sharp penknife, the blade of which should have been sterilised by passing it through a flame and rinsing in an antiseptic solution. The blade should penetrate down to the deepest point of the wound, and so enlarge it as to allow the free exit of all the matter collected in it. A poultice or fomentation should be firmly bandaged over the wound and the part kept at rest. If there is much suppuration, there is likely to be considerable disturbance of the patient's health generally, and means should be taken to eliminate the poisons which are circulating in the body and causing the disturbance by keeping the bowels freely open by means of castor oil or salts, and the food should be nourishing.

Cuts.—Attention must be drawn to one or two old-fashioned ideas about cuts or wounds. It is one of the most easily obtained and at the same time one of the most dangerous means of stopping the bleeding from a small cut to apply to it a piece of cobweb. This does undoubtedly help to hasten the clotting of the blood as it appears, and so tends to stop the bleeding, but from what has been said as to the treatment of wounds, it is clear that the most important condition to be attained is to secure absolute surgical cleanliness. This implies not merely the absence of anything visible in the way of dirt or impurity—remember that anything is impure from this standpoint—it implies the absence of that minute bacterial impurity which is invisible to the naked eye. It surely needs no special emphasis to assure anyone that a cobweb of all things is dirt and dirt alone. The meshes of the web are literally covered with particles of dust of all kinds, and constitute a highly dangerous source of infection when applied to an open cut or wound. On no account whatever should this ancient remedy be applied. The cases in which it is usually applied are those little cuts, the bleeding from which is never serious, and is in most cases rather a beneficial matter for the healthy full-blooded person than any great harm.

It is supposed by some persons that cuts in the regions of the webs of the fingers are specially dangerous from the probability that lockjaw will supervene. One has only to remember that lockjaw is an infective disease caused by its own particular micro-organism, without which there can be no possibility of the disease occurring. The organism which causes lockjaw is found chiefly in the ground, flourishing in the soil or clay or in manure. It is, then, only in wounds caused by instruments which are dirty from the presence of clay or manure that the infection can occur. Of course all wounds so caused will not result in lockjaw—if that were the case it would be a much more common disease than it is—it is only in a very small proportion that symptoms of the disease supervene. The situation of the wound has nothing whatever to do with the risk of the disease, nor has the extent of the wound. A wound in the web of the fingers has no more danger of resulting in lockjaw than has a wound in any other part of the body, and persons who have received cuts in these positions need have no special fear or worry on this account. The fear or dread of lockjaw will not bring on the disease—people are occasionally said to have frightened themselves into a certain disease—they merely make the patient more uncomfortable than is necessary. The only thing which can cause the symptoms of lockjaw to manifest themselves is the entrance into the wound of the special germ of the disease.

Special Injuries.—*The Head.*—The greatest care must always be exercised in dealing with a person who has had an accident to his head in the way of a severe blow or fall. The patient may be conscious or not, there may be very little external evidence of any injury or bruising, but in all cases the patient should have medical attention at the earliest possible opportunity. Such a patient must be moved with the greatest care, as there is always the possibility that his skull has been fractured or that one of the blood-vessels which lie on the inner surface of the skull may have been ruptured. Bleeding from the nose and ears is always to be regarded as a suspicious sign, especially if the blood is accompanied by a clear, colourless fluid such as may be found beneath a blister. Keep the patient as quiet as possible, and procure medical assistance without delay.

The Abdomen.—Injuries of the abdomen are always associated with a large degree of shock, which must be treated appropriately. In cases where the abdomen is opened by penetrating wounds or cuts, much may be done to relieve the patient and prevent further damage, pending skilled assistance. If the wound is a transverse one across the abdomen or a puncture, lay the patient on his back and flex the thighs by placing pillows or cushions beneath the knees, whereas if the wound be vertical, keep him on his back with the legs stretched straight out. If portions of the bowels protrude from the wound they must be kept warm and moist by covering them with clean cloths wrung out of warm water to which some common salt has been added. If the bowels are being ripped or strangulated by being caught in the edges of the wound, as will be seen by their becoming dark and congested, an attempt should be made, having well washed them with the warm salt solution, to replace them within the abdomen. The hands should be thoroughly cleansed and warmed, and only gentle pressure and manipulation should be employed. No force is to be used, as the structures are very delicate and may easily be ruptured.

Rupture or Hernia.—There are certain parts of the abdominal wall which are weaker than the rest, and through these places a portion of the bowel may protrude as the result of some severe strain, such as attempting to lift too heavy a weight or making too great an effort to empty the bowels. These places are in the groin, into the scrotum, and at the navel. The patient may experience some pain and be conscious that something has happened. He should be laid on his back with the knees supported on a pillow or cushion. This may cause the bowel to return of its own accord, or it may be helped to do so by gentle manipulation, the patient being told to keep the mouth open. A pad should be placed over the spot and secured firmly in position by means of a tight bandage. If the rupture is painful and cannot be easily replaced, keep the patient at rest on his back and send for a doctor.

ARTIFICIAL RESPIRATION

The respiration is a continuous process which goes on without interruption, regulated and controlled by a special centre in the brain. By it the lungs are alternately filled with fresh air and then emptied of it, the oxygen of the air having been largely taken up by the blood. In inspiration the total volume of the chest is increased, the lungs expand owing to the elasticity of the walls of the minute branches into which they divide, and the air is drawn in. The expansion is brought about by muscular effort, by which the ribs are raised and opened out, and the diaphragm which separates the chest from the abdomen is pulled downwards, thus increasing the volume of the chest. Expiration, normally, requires very little muscular effort, being brought about by the natural tendency of the ribs to fall together again. It is only in forced expiration, when an effort is made to get rid of the remaining quantity of air which is left in the lungs, that any appreciable muscular effort is made. This process of inspiration and expiration, which together form respiration, goes on regularly about fifteen to twenty times a minute in normal health, and by it the blood is kept supplied with oxygen, which is used up in the body. Failure to secure the adequate supply of oxygen results in a condition known as asphyxia, where the blood is unable to perform the duties required of it owing to an insufficient supply of oxygen. One of the results of this is that the centre in the brain which regulates the breathing function becomes affected, and the breathing becomes irregular and may ultimately stop. This may happen even though there is a certain amount of circulation going on throughout the body, and the person, though showing very little evidences of life, is in a condition in which, if the breathing can be re-established, the circulation is stimulated and life apparently returns.

This condition of asphyxia may be caused in various ways. Anything which interferes with the supply of air to the lungs will soon cause it to be established. A piece of meat or a crust of bread lodging in the windpipe—"going down the wrong way" as it is called—may so occlude the passage that the patient gets into an asphyxiated state. This, of course, is the ordinary choking. Anything which, by exerting pressure on the mouth and nose or on the windpipe prevents the entrance of air, also causes the condition. Smothering and strangulation are examples of this. One of the commonest causes is drowning, where not only does the water prevent the access of air but it often enters the lungs themselves and fills the chambers which normally contain air. The interference with the passage of the air may come from within the throat, the tissues becoming swollen from inflammation or the taking of certain poisons. Certain diseases also cause such alteration in the parts at the back of the mouth and in the throat as to interfere seriously with respiration. Diphtheria is a marked instance of this kind. Severe pressure on the chest may prevent the expansion of its walls which is necessary to draw the air in, such as a heavy fall of earth on a man. This may be so heavy on his chest as to suffocate him, although his head is exposed to the atmosphere. If the supply of oxygen is cut off, as when the atmosphere is impregnated with gases of various kinds or with heavy fumes, the lungs become filled with the gas or fumes, from which they are unable to extract any oxygen, and a condition of asphyxia ensues. There is yet another cause in which the prime derangement takes place in the nervous centre in the brain, and is not due to any interferences with the supply of oxygen. This is seen in certain kinds of poisoning, and in such injuries as strokes of lightning and severe electric shocks. Before proceeding to discuss what should be done in each case, a description of the methods employed to restore the failing respiration will be given, one or other of which may be used in each case. There are four well-known methods with which everyone should be thoroughly familiar, as accidents of the above nature are comparatively common occurrences, and the sole hope of successful treatment lies in its immediate application. Many persons may be on the spot at the time of, or soon after, the accident who are helpless through not knowing what to do, whereas a single person, relying purely on his own efforts, may be able to save a life which would otherwise be inevitably lost. These methods may be practised on the living bodies of willing friends, who by thus enabling another to become proficient may at some future date feel that they too have a share in saving a life which their help has enabled one of their number to rescue.

Marshall Hall's Method.—The object of all methods of artificial respiration is, by causing the chest to expand and contract as it does in health, to induce air to enter the lungs, give up its oxygen, and be expelled when that has been done. The movements of the healthy chest, which are occasioned by the action of certain muscles of the body, are imitated by the muscles or weight of the assistant till such time as the reviving body is able to carry on these movements of its own accord. The chest walls are compressed so as to simulate the movement of expiration, and encouraged to expand in a manner which resembles inspiration. These movements must be carried out at the rate of normal respiration. Taking this as being, on an average, fifteen times to the minute, it is clear that each respiratory act occupies four seconds. The aim of the assistant, then, is to carry out the movements at such a rate that the chest is compressed for two seconds, and is helped to expand for a like period. This is the point where mistakes are most likely to be made. In the excitement of the accident, and with a view, doubtless, to restore the patient as speedily as possible, the movements are rushed and carried through at a break-neck speed, to the early exhaustion of the over-zealous assistant, and with no benefit to the patient. The movements must be carried out slowly and regularly, at the rate of fifteen to the minute, no matter what particular method may be employed.

The method suggested by Marshall Hall consists in placing the patient on his face on the ground with a pillow beneath his chest. A coat may be rolled up into a bundle to act as a pillow, or any other device may be employed. The arm of the patient is placed beneath his forehead, to raise the mouth from the ground, and he is then rolled over on to his side so that the chest is well clear of the pillow. He is next turned back on to his face, so that the chest rests on the pillow and the head falls on to the arm. The assistant now presses firmly with the palms of his hands on the patient's back between his shoulder-blades. This movement compresses the chest, corresponding to expiration, and lasts for two seconds. The patient is then turned on his side and the chest expands on account of the elasticity of the ribs, thus simulating inspiration. This also lasts for two seconds. The process is repeated as long as is necessary, and

Marshall Hall's Method of Artificial Respiration.—Expiration.

may be varied by occasionally turning the patient on to the other side. It will be found that this method requires two or more assistants, one of whom is told off to keep the arm in the correct position.

Silvester's Method.—The patient is placed on his back, if possible on a sloping portion of ground, so that his head is the lowest part of his body. A pillow or pad is placed beneath the shoulders. The assistant kneels at the head of the patient, facing him, and takes hold of his arms just below the elbow joints. He raises the arms slowly, bringing them upwards, outwards, and backwards in the arc of a circle till they lie flat on the ground, one on either side of the assistant. This causes the chest to expand, and air is sucked in. After a short interval the arms are raised, the forearms bent at the elbows on to the upper arms, and brought to lie on each side of the chest, in which position the assistant bends forwards, and by throwing the weight of his body on to the arms compresses the chest and drives the air out. These movements are repeated slowly and regularly fifteen times a minute.

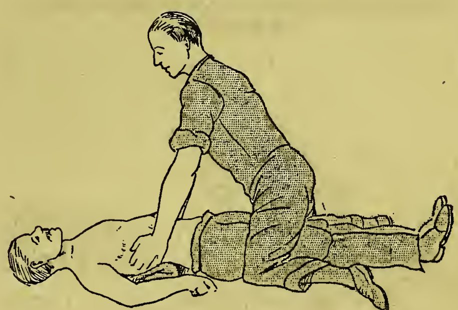
Howard's Method.—The patient is placed on his back with a pillow beneath the shoulder blades as before. The assistant kneels with one leg on either side of the patient's hips and facing him. He places his hands flat on the sides of the chest at the lowest part of the ribs. The assistant then presses the two sides together, and by bending forwards throws the weight of his body on to the chest, so as to compress it and drive out the air. After a pause of two seconds, he suddenly swings back again, relaxing the pressure but still keeping his hands on the sides of the chest, which is thus allowed to expand and draw air in, and after a pause of two seconds the movement is repeated.

Probably the most widely used of these three methods is a combination of Silvester's and Howard's. It can, of course, only be employed if there is more than one assistant. During the time that Silvester's method is being employed by an assistant at the head, a second assistant, working in union, performs Howard's method at the lower part of the chest. In this way a greater amount of compression and expansion can be obtained than in either of the methods employed separately.

The great objection to these methods is that they require a considerable expenditure of energy on the part of the assistant. If he can be relieved by others when he is exhausted, this does not matter, but if there is only one, it is not unlikely that as he becomes tired his efforts begin to flag, and that too, possibly, at a moment when a little more perseverance would have brought about a successful issue.

In all of these methods there are certain precautions which must be taken to render them efficacious. These points must be carefully attended to, as if neglected the whole proceeding is rendered futile and much valuable time and energy are wasted. All tight clothing should be removed from the neck and chest. The collar and tie must be removed and the vest and shirt opened up. In men the braces must be unfastened, or the belt removed, and the trousers should be undone. In women

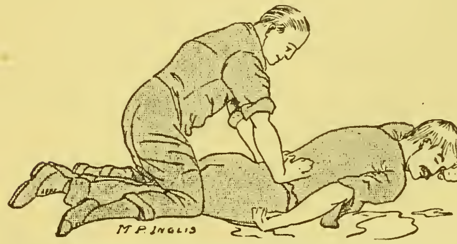
Howard's Method of Artificial Respiration.—
(1) Expiration.



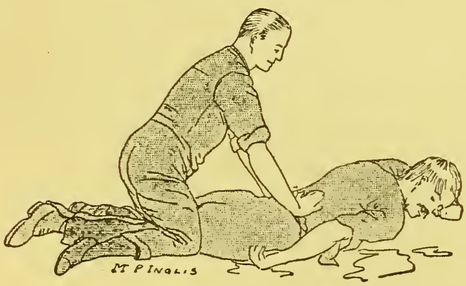
(2) Inspiration.

the waist-belt must be removed and the corsets opened. Any bands supporting the underclothes round the waist must be loosened. As no time should be wasted in doing this, they may have to be cut by a knife or pair of scissors. Any impediment to the entrance of air into the windpipe must be removed; the mouth and nose should be cleaned; false teeth, if present, should be removed, and the mouth kept clean if it becomes filled up with saliva. The tongue must be pulled well out of the mouth and kept in that position. If this is not done it falls back when the patient is lying on his back and closes the entrance to the windpipe. The tongue may be held in position by an assistant specially told off for this purpose, or it may be secured by a piece of string passing round it and the chin, or by a bandage passing over the protruded lip and round the back of the head.

Schäfer's Method.—This comparatively recently introduced method of performing artificial respiration is in many ways superior to all the above, and only needs to be more widely known to be generally adopted. The procedure is as simple as it is effective. The patient is laid on the ground, face downwards, with a pillow of some sort beneath the lower portion of the chest. A small pillow or roll of clothing may be placed beneath the forehead, but the same end may be gained by turning the head to one side. The assistant places one leg each side of the patient on a level with his hips and lays his hands flat on the back of the chest over the lowest ribs, the thumbs almost meeting in the middle line of the body. Keeping the arms straight and without any tension in the muscles, the assistant bends forward and throws the weight of his body through the arms on to the back of the chest, which is thus compressed and exhausted of any air it may contain. The pressure is maintained for the space of two seconds, when the body is raised from the hips so that the weight is taken off the arms; the hands,



Professor Schäfer's Method of Artificial Respiration.
(1) Expiration.



(2) Inspiration.

however, being kept fixed in position. In this way the chest is allowed to expand, and by repeating the process regularly, fifteen times to the minute, the natural movements of the chest are imitated.

The advantages of this method are numerous. There is no delay in removing clothing or securing the tongue in a position that is out of the way. The tongue naturally hangs downwards from the mouth when the patient is lying on his face, and any liquid which collects in the mouth has a ready means of escape. In cases of drowning the advantage is enormous, as any water which has been taken into the body is enabled to escape without in any way interfering with the continuous performance of the method. As there is no muscular effort of any consequence required of the assistant, the process can be carried out by a single person without any help for practically any period. Actual experiments show that the amount of air taken in and given out during the performance of this method are greater than when any other is adopted. Owing to the fact that there is no disturbance of the patient's position, there is no risk of injury to any part or organ of his body. For these reasons it is clear that this method is the one which should be adopted in all cases of asphyxia, but especially so in those cases due to drowning.

During the time that artificial respiration is being performed, help may be given to the patient in other ways. The circulation may be assisted by rubbing the legs upwards from the feet to the body, and, if the arms are free, by rubbing them also from the hands upwards. This may be done by another assistant using his hands or, better still, warm flannel cloths. Smelling salts may be applied to the nostrils, and the chest may be flicked by wet cloths, or hot and cold water alternately may be applied. The patient must get as much fresh air as possible: for this reason all spectators must be kept well back, and if he is in a room the windows should be well opened.

The question naturally arises, How long should artificial respiration be maintained? To this it is impossible to give a definite answer. Circumstances, such as the scarcity of assistants, may necessitate a cessation at a comparatively early stage, but in no case should the process be given up in less than two hours. Cases have been recorded in which there were no signs of life till well over two hours had been spent, yet at the end of that time the patient showed signs of recovery and his life was saved. No hard and fast rule can be laid down, but no one should desist till he is perfectly satisfied that further measures are useless. The process should certainly be continued until the arrival of a doctor. When breathing does show signs of returning, the artificial respiration should be kept up for some time, the rate being made to correspond to that of the natural breathing. When it is deemed advisable to stop, attention must always be directed to the patient's breathing, and if, as occasionally happens, this shows any signs of ceasing, the procedure must be renewed. When the breathing is well established the patient should be wrapped in warm blankets, and hot water bottles, well covered with flannels, should be applied to the feet and body. As soon as the patient is able to swallow, some hot tea or coffee, or a little brandy and water, should be given. He should be kept at rest in bed for a few days, till he feels completely recovered.

Drowning.—This is one of the most common causes of asphyxia, though in this case the danger arises not only from the prevention of the access of air, but also from the tendency to the entrance of water into the spaces in the lungs which normally contain air. In cases of asphyxia due to mere stoppage of the air supply the lung tissues, for a considerable time, at least, undergo no physical changes, and retain their natural powers, so as to be capable of resuming their functions of absorbing oxygen from the air and getting rid of the useless and ultimately harmful gases from the blood. When, however, the lungs are filled with fluid, these functions are much more seriously impaired, and the restoration of the apparently drowned is a matter of considerably greater difficulty and anxiety than in the simpler cases of pure asphyxia. When a person is in danger of drowning his breathing becomes embarrassed both from the inability to get air into the lungs and from the pressure of the water on his chest. Water is in many cases gulped into the stomach, which becomes filled, and so adds to the difficulty of breathing. In the later stages, when consciousness has been lost, the muscular control over the entrance to the air passages fails, and water is allowed to enter the lungs, thus causing an additional complication. As the body becomes in this way waterlogged it grows heavier, and is much more likely to sink. A normal body with the lungs full of air will float. Some bodies float more readily than others, depending largely on the amount of the comparatively light fat with which the body is clothed. There are different beliefs in different parts of the country as to the number of times a drowning person will reappear at the surface of the water. Such beliefs are, of course, no more than superstition. A body may not appear again on the surface of the water at all after it has once disappeared, or it may return to the surface for almost any number of times before finally disappearing. The process of sinking and rising again depends on the amount of water that has been taken into the stomach and the lungs. A waterlogged body sinks to the bottom, where it will remain till it is disturbed by some artificial means, or till, owing to the natural processes of decomposition, it becomes light enough to return to the surface and float. It is often asked, How long will the body of a drowned person remain under the water ? This depends on various circumstances, depending on the state of development of the body, on the state of health of the person before the accident, and on the specific gravity and temperature of the water. If the water is warm the body will rise earlier than in the case of cold water, as for instance in summer as compared with winter, in tropical waters as compared with more temperate, or shallow water, and consequently less cold, as compared with deep water. Again, a body lying in a pool will rise earlier than one lying at the bottom of a river, as the stagnant waters of the pool are more likely to retain any warmth they may acquire from the sun. On an average it may be taken that in a temperate clime such as that of the British Isles a body will reappear at the surface inside a week. It is, then, at this time that watch should be kept when it is known that a person has been drowned and the body has not already been recovered.

Another important question is, What length of time must a body be immersed in the water before death takes place ? This question cannot be easily answered, for obvious reasons; nor is it one of any practical importance. As soon as it is known that a person is in difficulties in the water, no time must be lost in getting him removed from danger as soon as possible. The readiest means at hand must be used, and a great deal depends on the common sense and coolness of anyone who happens to be in a position to render assistance. In many cases persons who are in the water get into difficulties and shout for help. There may be practically no risk of their drowning if such help is forthcoming: delay in affording it may entail the loss of a life. It is always to be borne in mind that a person may be drowned in quite shallow water as well as in a great depth. A person may, in falling into comparatively shallow water, sustain an injury to his head so as to render him unconscious and may be in imminent danger; while bathing in water of not more than three or four feet in depth, the bather may be seized with cramp, or may become entangled in weeds and rendered helpless, or become fixed beneath the surface by a specially rapid current. In all such cases it is the duty, as well as the privilege, of the person at hand to get into the water immediately and help the patient out. Other cases do not present the same easy means of succour, and may require greater effort on the part of the spectator of the accident. No effort should be considered too great. A man may fall into deep water and speedily find himself in difficulties. Anything at hand which will float—a lifebuoy, a block of wood, a cask or barrel—should be thrown into the water, not at the person, but close to him. By means of this he may be enabled to keep afloat till further assistance is given. A rope may be at hand, an end of which should be thrown to the person in the water, care being taken to secure the other end. By this means the person may be drawn to the edge and may scramble or be helped out, or he may be kept there till he is lifted out into a boat, if it is impossible to get down to the water's edge. The person should be instructed to pass the end of the rope twice or more round his chest beneath the arms, as he may readily become exhausted in attempting to hold on to the rope by means of his hands. If there is no means available of rendering help, the spectator must be prepared to plunge in himself and render assistance. As little time as possible should be lost in getting into the water, but it will usually occupy but a moment to divest oneself of coat and vest, thus making the weight of damp and heavy clothes to be borne much less, and giving greater freedom to the body and arms. If shoes are worn, they can usually be removed with very little loss of time. Judgment must be used in deciding whether the time lost in removing boots will be short enough to make up for the greater ease of proceeding when once the water has been entered. If the ground is low at the water's edge, the quickest means of entering is by diving. It may be, however, that the distance is too great to dive with safety. In this case some other way of getting to the edge is to be found, or failing this, a jump or drop, feet foremost, should be made. If a boat is at hand, it may be quicker to row to the spot where the person is or was last seen: this is usually a matter requiring too long a space of time, unless the spectator happens to be in a boat at the time of the accident. Whatever means be adopted, the aim is to get to the person in difficulties as soon as possible, always remembering, however, to proceed with such caution as not to arrive in a state of exhaustion at a time when it may be necessary to exercise all the strength of which the body and mind are capable. The treatment of the case now depends on the condition in which the person is found. He may be unconscious, or so exhausted as to be docile and easy of management: on the other hand, he may still be struggling, and may so embarrass the rescuer as to endanger the lives of both. The rescuer must in all cases be the active agent, and do all that is possible to prevent the drowning person securing the upper hand in his struggles. Avoid, if possible, being clutched by the person: this is most easily prevented by approaching him from behind and seizing him firmly. This may give sufficient confidence to the struggling person as to cause him to cease his efforts and give himself entirely over to the rescuer. If, however, the latter be caught, he must free himself as quickly as possible. If caught by the wrists, the arms should be turned downwards and outwards by a rapid jerk. This will in all probability cause the grip to be relaxed, and will place the patient in such a position that he can be secured. A similar jerk of the leg will cause a grip of the ankle to be relaxed. If the patient places his arm round the rescuer's neck and so impedes his movements, place a hand firmly over his mouth and nose and push him away. Greater difficulty may be experienced if the drowning person clutches the rescuer round the body. Place a hand under the chin and, with a knee doubled up and pressing against the body, push him away as forcibly as possible. Try to calm the person by reassuring him as to the certainty of rescue if he will do as the rescuer commands. Get him to lie on his back and seize the arms just above the elbows, the rescuer swimming on his back beneath the patient. Hold the arms out from the sides as much as possible, so as not to impede the movements of the chest in breathing. If it is impossible, owing to the continued struggles of the patient, to hold the arms in this way, he may be supported and more or less restrained by passing the arms from below upwards round the chest beneath the arms. If the patient is unconscious or calm enough not to struggle, he may be brought ashore by supporting his head with a hand on either side of the neck, the rescuer, as before, swimming on his back. In each of these methods the rescuer has had to swim on his back, using only his feet for propulsion. If the patient is merely exhausted or suffering from cramp, the ordinary breast stroke may be used, the patient lying on the rescuer's back and keeping himself in position with his hands on the rescuer's shoulders. If the body has sunk by the time the rescuer reaches the spot of the accident, it is necessary to dive and attempt to bring the body to the surface. Bubbles of air may be seen bursting from the water over the spot where the body has sunk, and will help to localise its position. Whatever method of conveying the body to the shore is employed, care must be taken to keep the bead, or at least the mouth and nose, out of the water. For this reason it is not advisable to drag the body through the water by the feet, as in that case the head is certain to be beneath the surface.

The patient having been got ashore, should immediately be turned face downwards, with a pillow or rolled-up coat beneath the abdomen, to allow as much water as possible to escape. A finger should be swept round the inside of the mouth to remove any dirt, weeds, or similar substance which may have entered. If the patient is merely exhausted or cramped, but is still breathing, he should have all the wet garments removed, and be dried with rough towels as soon as possible. Warm blankets should be procured, and the patient well wrapped up and carried to a house, where a bed should be got ready with warm blankets and hot-water bottles. The patient should be placed between blankets, without any sheets, as the former retain all the natural heat in the body. A stimulant should be given, such as hot coffee or some brandy and water, and the patient left at rest. If he has been much exhausted, he will soon fall into a quiet sleep and awake much refreshed. After such an experience a person should be kept quiet and allowed to do nothing till he feels thoroughly well again. It is always desirable to have him seen by a medical man as soon as possible after the accident.

In the more serious case where the patient has stopped breathing, artificial respiration must be commenced without delay. All tight clothing about the chest and neck must be loosened. The collar and tie should be removed, and the shirt and vest opened up freely. In the case of women the corsets must be opened, and, if possible, removed; the belt around the waist must be loosened, as well as any tapes which support the under garments. Someone should be sent to summon a doctor at the earliest moment, and till he arrives one or other of the methods of artificial respiration must be employed. Undoubtedly the easiest and best method to adopt is Professor Schäfer's, for the reasons which have been given in the section describing it. If any of the other methods is adopted, care must be taken to see that the mouth is cleared of any obstruction, and that the tongue is kept in position with the tip well outside the mouth. False teeth, if present, should be removed. The process of artificial respiration must be persisted in till the doctor arrives and takes charge of the case. Under no circumstances should the attempt be given up inside two hours, as many cases, apparently hopeless up to that time, have ultimately recovered. During this time further help may be given by other assistants. The damp, cold clothes should be removed and the limbs and body rubbed with rough towels or cloths. This not only dries the skin, but also adds to the warmth of the body by the friction. The limbs should be rubbed firmly from the hands and feet towards the body to encourage the circulation. Smelling salts may be applied to the nostrils, and the chest may be flicked with a towel soaked in cold water. Both of these means help to restore animation by acting indirectly on the nerve centres controlling the respiration and the circulation. The movements must be performed rhythmically and methodically at the rate of fifteen times to the minute.

How can the resumption of breathing be detected? In many cases it is quite obvious that the breathing is restored, and the patient exhibits other signs of life. It is, however, important that the slightest indication of the return of the function of the lungs should be observed. The ray of hope which its recognition brings to the wearied and almost despairing assistant acts as a stimulus to renewed effort on his part, and enables the movements to be carried out at intervals corresponding to the natural inspiration and expiration. The ear applied close to the mouth or nose may detect a very faint sound caused by the feeble stream of air which is entering or leaving the chest, or the delicate skin of the cheek or ear may feel the feeble current. The skin of the back of the hand is also very sensitive, and may detect a breath too feeble to be otherwise noticed. The looking-glass test may also be employed. A piece of a mirror or ordinary glass is held close to the mouth and nose and will become dimmed on the surface if any air is being expired from the lungs. Any bright polished surface will exhibit the same phenomenon, such as a silver cigarette case or match box. The pulse should also be examined at the wrist to see if there is any return of the circulation. When breathing has been properly established there is no longer any need to continue the process of artificial respiration, but the patient must be kept under close observation, in case it again stops, when recourse must again be had to the method employed. The patient must be kept warm by means of rugs or blankets: it is much more important to conserve the warmth which comes from within when the functions of respiration and circulation are completely established, than to attempt to warm the body from the outside. The practice occasionally employed of placing the patient in a warm bath is not one to be adopted, and should not be done except at the bidding of a medical man, and under his supervision. As soon as it is ascertained that the patient can swallow, some stimulant should be given, such as a cup of hot coffee or a teaspoonful of brandy in a little water. This may be repeated at intervals of half an hour. When the patient is sufficiently recovered to be moved, he should be taken to a house and placed in a warm bed between blankets. He should be kept in bed for two or three days and carefully watched in case the signs of any consequent complication make their appearance.

The bed should be prepared by warming the blankets, between which the patient is to lie, before the fire, and by keeping them warm by means of hot-water bottles. A flannel nightdress or nightshirt should also be well warmed, and a supply of hot-water bottles prepared for use. To prepare a hot-water bottle properly it should be warmed up before the hot water is poured in. This may be done by placing the bottle, having previously removed the stopper, in an oven or on the top of a stove. A little boiling water should be placed in the bottle during this heating process. When the bottle is needed for use, boiling water should be poured in, care being taken that too much water is not used. The bottle should not be completely filled: a considerable air space should be left to prevent any risk of bursting when the stopper is screwed home. If rubber bottles are used, they should only be heated by means of warm water. Do not place them in an oven or on a stove. All such bottles should have flannel coverings or bags, into which they are placed, the mouths being closed by means of tapes. This enables the warmth to be retained for a longer period and prevents the risk of blisters being raised on the skin of a person whose vitality has been lowered. The water in the bottles should be renewed at intervals, and the positions of the bottles in relation to the patient should be changed at each such interval. Improvised hot-water bottles may be made by using any ordinary bottles which are at hand. They should be prepared in the manner indicated, but special care must be taken not to fill them too full, and to see that they are securely corked, so that no leakage of the boiling water can occur. They may be covered by being slipped into thick woollen socks or stockings in the absence of suitable flannel cloths. Failing these, bricks may be warmed in an oven and covered in the same way. Sufficient covering must be employed to round off the sharp edges and corners.

While it is clear that a person may be in danger of drowning in a place where help may be given by a spectator who is unable to swim, there are many cases in which a degree of prowess in swimming is necessary to enable any assistance to be given. Although it is true that few people may ever be called on to rescue a person from death by drowning, there are other reasons why everyone, who is physically fit, should learn to swim. There are few exercises at the same time so enjoyable and capable of developing every part of the body. There is scarcely a muscle in the whole body which is not used and consequently developed in swimming exercises, and the general effect of the open air and the water on the skin is highly beneficial. Many poorly developed children have been transformed into strong healthy individuals by a carefully supervised course of bathing and swimming. One of the most noticeable results is the increase in the size and power of the chest. There are, however, certain precautions which should be taken, and would do much to lessen the number of drowning accidents round our coasts. Children should never be allowed to bathe by themselves alone; an older person should always be present to keep a close watch on all that goes on and prevent the little ones getting into any danger. Girls especially should not bathe, much less attempt anything serious in the way of swimming, if they are not feeling quite well and up to the mark. No one should be allowed to bathe when exhausted or chilled or overheated. An interval of at least an hour should be allowed to elapse between a meal and a bathe, and no one should remain in the water long enough to experience a sensation of chilliness. With regard to long-distance swimming, such should only be attempted by those who are physically strong and powerful swimmers. In all cases the swimmer should be accompanied by a boat or by other swimmers—a long swim should not be undertaken alone. In swimming away from the land always remember that the return journey has to be made and will require as much expenditure of energy as was expended on the outward journey. Many drowning accidents are the result of thoughtlessness and foolhardiness in dealing with small boats. It will always be found that the more experienced a boatman is the more careful he is in all matters relating to the management of the boat and crew. That discretion is the better part of valour is nowhere more true than in this connection. The holiday-maker at the seaside would be well advised to copy the example of the more experienced waterman and exercise the utmost caution when in a small boat. Of course accidents will happen: no amount of caution can prevent their occurrence, but a wise discretion may reduce the number of preventable accidents to its desired minimum.

Suffocation.—Suffocation may be caused by many different things, all of which act by impregnating the air and so interfering with the supply of oxygen. Perhaps the commonest is smoke in cases of houses which are burning. In a burning house a person is in danger not only of being burned to a greater or less extent, but also of being suffocated by the volumes of smoke which expel the air and replace it in a closed room or confined space. The escape into a room of ordinary coal gas from a gas pipe, whether accidental or intentional, may suffocate any people who are in the room if no means of escape is given to the gas. The fumes of certain fires contain a sufficient proportion of noxious gases to be highly dangerous if good ventilation is not secured. Fires of charcoal or coke are especially capable of generating such harmful gases, and should be used indoors only when there is every certainty that all the products of their combustion are carried by chimneys or pipes directly to the outside of the house. These fires are frequently used in open braziers in outdoor work, where they are quite safe, but such an apparatus should never be used indoors. Asbestos gas fires are now frequently used in rooms, and are very convenient, as they can be turned out when the room is not in use, and thus the waste of an ordinary coal fire is saved. It occasionally happens that such a gas fire produces an unpleasant smell in its neighbourhood. This is due to the presence of some impurities, and though never of sufficient degree to be actually dangerous, it has a bad effect on the health of persons in close and continuous conta ᐩ with it. This may be prevented by ensuring that there is a good draught up the chimney, and by keeping a saucer or bowl of water on the hearth before the fire. The fumes of sewer gas are also poisonous, but the only danger of suffocation by them arises when a large sewer has to be inspected and it is necessary for a workman to enter the sewer through a manhole. The danger is not now so great as formerly, as sewers nowadays are properly ventilated and the gases are carried away. Before entering a sewer the air in it should be tested by means of a candle or lamp. The candle is lit and is lowered down into the sewer to be examined. If the candle continues to burn, there is no danger, and a man may enter with safety. If, however, the light is extinguished, there is not a sufficient supply of oxygen, and descent would be fraught with danger to human life. Measures must then be adopted towards clearing the sewer of the noxious gases before attempting to enter.

It will be noticed that in a crowded room or hall which is not properly ventilated the atmosphere quickly gets stuffy, and sensitive people may become so sick as to necessitate their leaving. This is due to the using up of the oxygen in the air available, and to its place being taken by the carbonic acid gas which is expired normally from the lungs. There is always present in the air a small trace of this gas, but when the proportion increases to a certain definite point it becomes harmful and detrimental to the health of the persons inhaling it. If present in large quantities it is capable of causing suffocation, instances of which are on record.

In all cases of suffocation the first thing to do is to remove the cause. This may be done by getting rid of the smoke or gas which is responsible for the condition, or by removing the patient to a clear space. The patient will be found in an asphyxiated condition, the degree depending on the density of the smoke or gas and the length of time to which he has been exposed to them. The further procedure, once he has been removed to the open air, is to perform artificial respiration, as has been shown, and send for a medical man. Before entering a building full of smoke or gas the mouth and nose should be covered by a wet handkerchief or towel, and all doors and windows should be opened as widely as possible to promote a draught and aid in the expulsion of the smoke. As the gas tends to rise as much as possible, the clearest air will be found nearest the floor, consequently the rescuer should keep as low as possible, even crawling on the floor. An insensible person may be removed in the manner described in the section on carrying the injured and wounded. On entering a room full of escaping gas open the windows as wide as possible, especially at the tops, and be very careful on no account to strike a light till the room is clear. Do not enter a room full of gas carrying a light. The result would be a disastrous explosion. If the gas is escaping from a burner which has been turned on, turn it off at once. If the escape is due to damage to a pipe which cannot be plugged immediately, turn the gas off at the meter. A small escape in a gas pipe may be controlled by plastering it over with soap. Then send for the plumber. Always remember, in case a fire occurs in a house, to turn off the supply of gas at the meter. If the fire causes damage to any of the gas pipes the escaping gas may increase the damage very considerably. It is always wiser to prevent this happening by cutting off the supply.

Smothering.—This, fortunately, is a comparatively rare accident and is usually met with in infants. It not infrequently arises from the child's being overlain by the mother with whom it is sleeping. The only way to prevent such an accident occurring is by providing a separate cot or cradle of its own for the child. No infant should be placed in a bed in which another person is asleep or is likely to fall asleep. Attention to this point would effectively prevent this unfortunate accident. It is most likely to occur in large families of the poorer classes, where accommodation is limited, but all interested in these cases should make a point of explaining this to the mother, and, if necessary, helping her to carry it out. Cases have happened where an infant has been smothered by turning over so as to lie with its mouth and nose on the pillow, or where it has slipped down beneath the clothes, which have been heavy enough to prevent its breathing. Careful nursing should prevent all such accidents. These cases, unfortunately, are not discovered till it is too late to do anything: the child is already dead; but until a medical man has seen the case and given it up as hopeless efforts should be made to restore breathing. But little force must be used in the case of a child whose bones and organs are weak and easily damaged. Perhaps the best method of performing artificial respiration on an infant is the following. Grasp the infant in both hands, with its back towards you: a hand is placed over each shoulder, the thumbs passing down in front and underneath the arms into the armpits, the fingers lying on the shoulder-blades on the back. Stand with the legs wide apart and let the infant hang between them. Then swing the infant up through the air till the arms are almost vertical again and its body falls over on the thumbs. Press the chest inwards with the fingers and keep in this position for a couple of minutes. Then swing downwards again to the original position. Do not end either of the movements with a sudden jerk, as this may cause injury to the infant. Repeat the movements about twelve times a minute. Stop at intervals and place the infant in a warm bath, and splash some cold water on the chest. A little whisky may be rubbed on the gums and on the chest. Remove the child from the bath; dry by rubbing briskly with a towel, and repeat the swinging movements. These measures should be continued till the doctor arrives.

Hanging.—A person is said to be hanged when suspended by the neck in such a way that the weight of the body causes pressure to be made by the rope or other means of suspension on the windpipe and vessels of the neck. Death usually is caused by asphyxia, though if the vessels are also pressed on and the circulation to or from the brain interfered with there is an added complication. This process is of course one which takes a certain time, and therein lies the hope of effectual aid in such a case. As in other modes of death by asphyxia, if help is rendered before the process has gone too far there is a chance of ultimate recovery. It must not, however, be supposed that in cases of judicial execution, there is the same delay. Here death is practically instantaneous, and is due not to a state of asphyxia being produced, but to a fracture or dislocation of the spinal column in the neck. Some so-called humanitarians object to this method of execution on the ground that death is not instantaneous, but their objection is not borne out by the actual facts. In dealing with a case of hanging the layman must proceed with caution. In most cases the discovery is not made till the victim is already dead, and has been so for some time. In such a case nothing can be done in the way of aid, and the only thing which should be done is to inform the police authorities, into whose charge the case is given, and by whom it is investigated, with a view to discovering whether the hanging be homicidal or suicidal.

Cases of accidental hanging do occur, and it is to these that there is the possibility of help being given. The accident may happen very simply. A child was looking out of a wondow and slipped. The cord of the blind was caught round the neck under the chin, with the result that the child was found in an asphyxiated condition. The accident happens most frequently with children when at play. The first thing to do is to cut the rope or cord by which the body is suspended, and free the neck from all constricting bands. Artificial respiration must then be employed, and kept up till the doctor arrives.

Strangulation.—A person is said to be strangled when death is caused by a band being tied so tightly round the neck as to prevent breathing, whereas in hanging the rope is but loosely fixed to the neck, and the real cause is the action of the weight of the body; it is the degree of tightness of the encircling band which causes strangulation. It is usually homicidal or accidental, and is consequently a subject for official investigation. As, however, the preservation of life is the all-important matter, the first person on the scene must proceed to render what help he can. Cut band away from the neck, open the clothes, and attempt to restore breathing in the manner already indicated. A doctor should be sent for at once, and the police authorities informed. Make a careful mental note of the position in which the victim was found.

Choking.—This may arise from a variety of causes, the most common being the passing of a crumb or bite of food into the opening of the windpipe, "going down the wrong way," as it is said. Other substances may also act in the same way; a false tooth may slip loose during sleep and choke the patient. If the throat is scalded by very hot liquids or acted on by corrosive poisons the tissues become inflamed and swell up to such an extent as to block the entrance to the air passages. In older people tumours in the neck and throat may so press on the windpipe as to interfere with the breathing. These cases are probably under medical attention, and will not come under the category of first-aid work. In diphtheria the throat may be blocked by the growth of the membrane. In the olden days the operation of tracheotomy had to be frequently performed to relieve the difficulty in breathing from this cause. The more recent methods of treatment, however, have done away with this necessity in the great majority of cases. By this operation an opening is made into the windpipe below the seat of obstruction, and a tube is inserted, through which the air may enter and leave the lungs. This operation, which may be one of the simplest and at other times one of the greatest difficulty, should always be performed by a medical man, hence the importance of summoning one as soon as possible in all such cases.

In cases of choking due to food or other substance going down the wrong way, the patient should be encouraged to dislodge the material by coughing as violently as possible. This will often be successful. A finger should be passed into the mouth and down the throat, and an attempt made to remove the obstruction in this way. If it brings on vomiting, that may clear the windpipe by getting rid of the material along with the vomit. The mouth should be kept open, to prevent the finger being bitten, by means of the handle of a knife or some such object. The body should be well shaken and the back thumped, with the head kept well forward. It is neither easy nor particularly effective to hold the person upside down by the heels. If necessary, artificial respiration must be performed till the doctor arrives.

When the throat is scalded or corroded, and breathing is rendered difficult on account of the inflammation, a hot stupe must be applied to the front of the neck. A piece of flannel or cloth should be wrung out of very hot water and placed on the throat. This should be renewed from time to time as it cools. The patient should be kept warm, and if ice is available some should be given to suck. Failing this, some cold water may be drunk. This will help to allay the inflammation. To soothe the injured tissues and make swallowing less painful, a little sweet oil of some kind should be given. Olive oil, salad oil, or glycerine will do. Here also, as in the other case, it may be necessary to perform artificial respiration till the doctor comes.

Electric Shocks.—With the great development of the use of electricity both in public and private life, it is much commoner now than formerly to find persons suffering from shock caused by contact with "live" wires. A live wire is one along which an electric current is passing, and though usually insulated by some suitable material or, as in the case of overhead tramway wires, placed in a position so as to be out of reach under ordinary circumstances, accidents may happen when the insulating material is defective or worn away or the uninsulated wire is exposed to the touch through a breakage or injury to its supports. At the point of contact with the body there may be a serious burn; of more immediate danger is the general condition of the patient, owing to the passage of the electric current through the body. This must be stopped as soon as possible. Where it is possible to turn off the current this must be done. In many cases, however, this is either impossible or would entail too great a delay. The patient must then be removed from contact with the live wire. He may be unable to do this of his own accord because he has been rendered unconscious, or because the muscles of his arms are so affected by the current, in a case where the hands are in contact with the conductor, that he is unable to use his arms voluntarily. He must then be removed by force. Remember that the human body is a conductor of electricity owing to the amount of moisture or fluid in the body, and that consequently the person in contact with the live wire is, as far as the current is concerned, practically a part of the wire. Care must be exercised, then, by the person about to render aid that he, too, is not placed in a like condition of danger. To do this he must prevent the current passing through his body, by insulating himself from the earth and from the patient. The best non-conductor is glass, on which the rescuer should stand. A couple of bottles may be used, or a pane from a window. India-rubber is also a good non-conductor, and some may be available in one form or other. Other substances may be used, such as wood, bricks, silk, cloth, hay or straw, all of which, when dry, are non-conductors. Moisture in any form is a splendid conductor of the electric current, and any substance which, when dry, is a non-conductor becomes a conductor if moistened or damp. This applies to all the above. The presence of moisture renders them useless for the purpose required: they can only be effective when dry. The person in this way insulated from the ground may now pull the patient away from contact with the live wire. The hands should be insulated before applying them to the patient or to the wire. Rubber gloves, being the ideal insulator, are not likely to be available—recourse must be had to other means which are. Any piece of cloth or article of clothing which is dry may be used; a rubber tobacco-pouch is a splendid substitute for the desired, but unavailable, rubber gloves; dry paper may be used in the form of a newspaper, or some pages of a magazine. A rug may be caught by two opposite corners and thrown over the patient's head as a loop, and his body so pulled away from danger. If a portion of dry rope is available it may be used in a similar manner, or a wooden walking-stick with a crook handle may be used to pull the patient away. Nothing in which there is any metal should be used, as this, of course, is an excellent conductor. The patient, when removed, may be found merely to be suffering from shock, in which case he should be kept lying on the ground well covered with warm clothes. Some stimulant may be given. If the shock and collapse are severe, and the breathing is interfered with, the clothes about the neck and chest must be removed, and the patient stimulated by means of cold water on the chest and face and brisk rubbing with rough cloths. If necessary, one or other of the methods of artificial breathing should be employed to restore animation, and the patient treated as has already been fully described. Any burns, if present, must be treated in the manner indicated under that section. The patient should always be seen by a medical man, in case there are any further injuries.

Lightning Stroke.—This is a comparatively rare occurrence, but is of such a nature that anyone may find himself face to face with a case. In the severer cases the victim is killed on the spot, being much charred and burned; in the less severe instances, he suffers from shock, and may exhibit burns of varying degree and size on his body. The treatment is on the same lines as in the case of electric shock, except that there is no danger in approaching the patient freely. The same means of restoring animation must be employed, and, if necessary, artificial respiration. A medical man should always be summoned to see the patient, as there may be damage of a nature not readily recognised. When out in a thunderstorm people should keep as much as possible in the open, avoiding the dangerous shelter offered by trees, &c. Keep away from any obvious conductor along which a flash of lightning would be likely to pass, having been attracted to it. If in a house, it is a good plan to close the windows and keep well away from the fire.

UNCONSCIOUSNESS AND FITS

This heading covers a variety of seizures, any of which may be met with in ordinary life. As the appropriate treatment differs in each case, depending on the cause of the condition, it is necessary to have such knowledge as will enable each case to be more or less satisfactorily diagnosed on the spot. The questions which arise may be summed up under the two main headings: What is to be done in the case of an unconscious person? and What is to be done in the case of a person in a fit? Each of the various conditions will be considered separately, beginning with the simple case of syncope or fainting.

To Test for Unconsciousness.—Normally in the body there are certain reflex movements which are not and cannot be controlled by the will. As a person becomes unconscious, these movements, along with the voluntary movements of the body, disappear. One of the last to go is what is known as the corneal reflex. When the eyelids are open and the eyeball is touched with the finger the lids tend to close or wink—in cases of unconsciousness this is not so. Raise the upper lid with the first finger by pressing the eyebrow upwards, and touch the eyeball with the second finger. If there is no response the patient is unconscious.

Syncope or Fainting.—Fainting is due to a deficiency in the blood-supply to the brain, by which the nerve centres which regulate the automatic movements necessary for life become anæmic and are unable to carry out their functions. This anæmia may be due either to loss of a quantity of blood or to disarrangement of the quantity of blood in the body, so that while other parts have more than their fair share the brain has less, owing to some nervous influences. This latter may be caused in various ways, some persons turning faint at the sight of blood, some in crowded halls, others again under circumstances in which they are specially sensitive. When a person faints, he falls to the ground, the body is limp and flaccid, the eyes are closed, the skin is pale and cold, and a cold sweat may break out on the body. The treatment is to get the blood back to the brain, and Nature gives us a hint as to how this should be done. The falling down of the fainting person brings his head to a lower level than it previously occupied, and enables the heart to supply it with blood without much exertion. The patient must be allowed to lie on the ground till he recovers, usually in quite a short time. The return of blood to the head may be aided by elevating the feet and legs. The collar and tie should be removed and the clothes about the chest opened. Some cold water may be thrown on the face and chest to stimulate the circulation, and smelling salts may be applied to the nose. The patient should not be allowed to sit up or stand till he is quite recovered, and a stimulant, such as hot coffee or a little brandy, may be given.

It is often possible to prevent a faint coming on. The person should get out into the air and either lie down on his back or sit down with his body bent forwards and the head hanging between the knees. A drink of cold water should be taken, and in this way the faint may be warded off.

Shock is for all practical purposes the same thing as fainting—the mental effect having exactly the same action on the blood-supply of the brain. The treatment is the same, the main indications being fresh air, the head kept low, and the clothes about the chest and neck loosened. It is always a good plan to examine the mouth of an insensible person to ensure that there is no obstruction to the breathing, which might cause the patient to become asphyxiated. False teeth may be dislodged in the fall, and would constitute a possible source of danger. They should be removed. There is one other rule which should always be observed in the case of an unconscious patient, namely, never to give him anything to swallow by the mouth till consciousness has completely returned. If this is not observed the patient may be choked.

Collapse.—This is a more serious condition than a mere fainting fit, and may follow prolonged exhaustion, severe abdominal injuries, large and serious burns, great loss of blood, and some varieties of poisoning. The patient is unconscious, the skin is very pale, cold, and clammy, the pulse is feeble, and the breathing weak and shallow. The body temperature tends to fall below normal, and may continue to fall unless means are taken to prevent its doing so. The initial treatment is the same as in a faint; the clothes are loosened, the head is kept low, and the patient is placed in a position where a good supply of air is obtainable. The temperature must be prevented from falling as much as possible: the patient should be kept in a warm bed in a room which has a good air supply, and all the windows kept open. Hot-water bottles should be applied to the feet, legs, and sides of the body, and hot flannels or fomentations applied to the stomach. As soon as consciousness has returned give some hot coffee or a little brandy. In cases where the collapse is due to lack of nourishment be very careful to give only small quantities of food at first, as larger amounts may be vomited and so do no good to the patient. If the collapse has been so extreme that the breathing is gone apply artificial respiration at once. In all cases send at once for a medical man, as though the collapse may have been successfully treated, the cause of it has still to be dealt with. As patients suffering from collapse are liable to relapses when all appears to be going well, they must be very carefully watched, and prevented from doing anything which would overtax their strength.

Concussion.—This is the state of unconsciousness which results from a blow on the head or a severe fall either on the head or on the feet. There are usually two stages of concussion; the first is one of shock, in which the same phenomena are observed as in the case already described; this is followed by a stage of reaction, which may appear in a few minutes or not for several hours, depending on the severity of the concussion. The first sign may be that the patient vomits, or there may be a mild convulsion. This soon passes off, and the temperature rises, it may be, to above the normal. The weakened pulse becomes quick and strong, but usually slackens again, and continues for some days at a slow rate. The treatment varies according to the stage at which the patient is found. In the initial stage the treatment already indicated for shock must be carried out, and the patient kept at rest in a darkened room and as quiet as possible. When the symptoms of shock pass away the head and shoulders should be slightly raised, and an icebag may be applied to the head. A light milk diet should be all that is given, and the bowels should be kept open. The patient should be confined to bed for at least a couple of weeks, and should be seen by a doctor.

Compression of the brain is an aggravated condition of concussion, and usually supervenes on it. The first-aid treatment is the same, and a doctor should always be summoned.

Apoplexy.—This is another form of unconsciousness due to the bursting of a blood-vessel in the brain. It is usually met with in elderly people, and in such as are of a full-blooded, plethoric appearance, and though often occasioned by some sudden strain or exertion may appear spontaneously. The patient falls unconscious to the ground, but, as opposed to cases of shock or concussion, the face is flushed and the breathing is loud and noisy, as though snoring. There is usually associated with the apoplexy some degree of paralysis. The most common is a paralysis of one half of the body. One side of the face appears to be drawn over to the other, and an arm and leg on the same side may be found to be paralysed. The period of unconsciousness may last for only a few minutes, or may continue for hours or even days. Medical help should be at once requisitioned, and if the patient recovers consciousness before the doctor arrives he must be kept as quiet as possible. The head and shoulders should be slightly raised, to prevent any extension of the hæmorrhage in the brain. If it is found necessary to move the patient, this must be done as gently as possible, and on no account must anything in the nature of a stimulant be given. This would only tend to increase the heart's action and cause an increase in the amount of the hæmorrhage. Icebags may be applied to the head, or cloths soaked in cold water and vinegar.

Epilepsy or Convulsions.—This is a manifestation of an abnormal condition of the brain of the individual who is prone to epileptic fits. In such a person there may be certain circumstances which determine the occasions of the seizures, or they may come on with no apparent cause. The person usually utters a cry and falls to the ground, where he rolls and writhes as though in agony. The body is twisted into all shapes, and the arms and legs are flung wildly about. The face is pale and contorted, and froth, which may be mixed with blood, issues from the mouth. The blood comes from the tongue, which has been bitten in the convulsions. All that can be done for such a person is to prevent his doing any damage to himself or to others during the period of the fit. He should be placed on the ground, if not already there, on a mattress or soft substance, if possible, and in any open space away from anything against which he might throw himself. The clothing about the neck and chest should be loosened. The movements of his arms and legs must be restrained, though not too forcibly, as bones might be broken. A twisted handkerchief should be placed between the teeth and tied behind the head to prevent the biting of the tongue, the mouth having been previously examined to see that there is nothing in it to interfere with respiration. Any false teeth should be removed. The fit passes off after a time, and leaves the patient in an exhausted state. He will most probably fall asleep, but must still be carefully watched as a second fit may follow, and the unguarded patient may do some serious damage to himself. If a man takes such a fit in the street and recovers, do not allow him to walk home alone, as he may have another fit and meet with severe injury.

Uræmia.—In a person suffering from chronic kidney disease there is always a possibility of a uræmic fit occurring. This resembles in many ways an epileptic seizure. Muscular twitchings and headaches usher in the fit, and the patient falls unconscious to the ground, where he is convulsed. When this passes off he remains in a dull, sleepy, lethargic state, from which he is with difficulty roused. The treatment of the disease is medical and all that can be done is to prevent any damage being incurred during the fit, and to have the patient put to bed as soon as possible.

Hysteria.—It is a curious faculty of hysterical subjects to be able to simulate with extraordinary degrees of accuracy the symptoms of various diseases. In certain cases of hysteria the patient, usually a young girl or woman, simulates an epileptic seizure with varying success. There may be some exciting cause, such as a fit of anger or an injury, or there may be complete absence of anything which would account for the performance. The differences from a true epileptic fit are such as to render the distinction an easy one. The patient screams continuously, and dashes about in an aimless fashion, but is careful never to cause herself any injury. She usually chooses some suitable place and occasion for the exhibition, lest it should pass unnoticed. There are no true convulsive movements, nor is there any unconsciousness. The eye-test will settle that point. There is no foaming at the mouth, nor is there any blood. The great thing is to neglect the patient, who is usually desirous of sympathy, failing which she soon returns to her senses. A splash or two of cold water may have an excellent effect in securing a speedy recovery. Isolated fits of this nature are of no consequence: a series of such seizures may, however, indicate that there is something either mentally or physically wrong with the patient, and a careful medical examination should be made.

Convulsions in Children.—These are usually due to some error in the infant's food or to trouble associated with the teeth. The child goes into spasms and is contorted, the face becomes blue, and there may be some degree of unconsciousness. Send for a doctor, and while he is coming place the child in a warm bath, and apply cold water by means of a sponge to the head and chest.

Alcohol and Opium.—Both these substances are capable of rendering a person unconscious, as is frequently seen, in the case of the former, in the persons who are said to be dead drunk. The symptoms of the two will be described in the section on poisons, but there are some points which deserve special mention in connection with the finding of an unconscious person. The smell of alcohol in the breath of such a person must not be taken as showing that he is drunk. A person poisoned by opium in some of its forms may have consumed a fair quantity of alcohol before taking the poison. A glass or two of whisky may have been the exciting cause of an apopletic or even an epileptic seizure in a person otherwise liable to such an occurrence, and the breath may afford strong evidence in favour of his merely being intoxicated. In each case, however, the characteristic symptoms of the particular form of seizure will be present, and should be looked for. It is only too common for a person found in a state of unconsciousness and smelling of alcohol to be conveyed to the nearest police station and put into a cell to sleep it off. This is decidedly wrong, and should never be done. The proper course to adopt is to have the patient removed to a hospital or to the nearest doctor, when if the cause be a serious one it will be recognised and properly treated. Even though it turn out to be merely a case of drunkenness, it is still the proper measure, as such a person is decidedly in need of medical treatment. The application of the stomach pump and the evacuation of the contents of the stomach will prevent any further absorption of the alcohol, and will hasten the return to consciousness. To place such a person in a cold cell is running the risk of very severe consequences in the lowered state of his vitality.

Heatstroke and Sunstroke.—A person may be stricken down by the intense heat of the rays of the sun, more especially in the tropics. In more temperate climes similar strokes occur, but there is usually some other agency at work, especially exhaustion and fatigue. The patient complains of weakness, sickness, and giddiness, with pains in the head. The pulse is weak, the skin is pale and sweats freely, there is a tendency towards fainting, and unconsciousness may supervene, with a temperature which is above the normal. The patient should be removed to a cool and airy place and sheltered from the sun. The clothes should be removed from the neck and chest, and the patient kept lying down with the head and shoulders raised. Free circulation of the air should be obtained by means of fans and open windows. Ice-bags or cloths soaked in cold water and vinegar should be applied to the head and spine, and water may be douched over the chest, till the temperature falls to normal. As soon as consciousness returns cold drinks should be given, and the patient kept at rest for a considerable time.

Excessive artificial heat, as well as solar, may cause heatstroke, which is a more serious form of sunstroke. The patient is profoundly unconscious, the face is flushed instead of being pale, the breathing and pulse are both rapid. The striking feature is the enormous height to which the temperature may run up. Some of the highest temperatures on record have been found in cases of heatstroke. The treatment is to be carried out on the same lines as already indicated, the chief object being to reduce the temperature. The body may have to be stripped and enveloped in cloths wrung out of ice-cold water, or even placed in an ice bath. If the temperature has been reduced by as much as five degrees it is usually advisable to cease the application of cold, as it will tend to sink lower if left to itself. The patient must be carefully looked after, and given mild stimulants as soon as he is able to swallow them.

Congelation.—Exposure to extreme cold can be borne with safety if proper precautions are taken and the man is strong and healthy. Weak persons, and persons suffering from exhaustion, may, however, succumb to the effects of intense cold, especially if accompanied by winds and wet. The person becomes prostrate and loses all muscular power. The body becomes cold and shivering, the face pale, the skin cold. There is much drowsiness, with muttering delirium and ultimately unconsciousness. The object in treating such a case is to restore the body heat. This must be done gradually and slowly. Wrap the patient up in warm blankets and promote the circulation and heat of the body by brisk rubbing of the legs and arms. Hot-water bottles should be placed round the body, and fomentations may be applied to the abdomen. If a bath is available, the patient may be placed in it as nearly as possible at the same temperature as the body, and hot water gradually added, the limbs being briskly rubbed all the time. As soon as he is able to swallow, some whisky or brandy should be given. The body should be well dried by rubbing with rough towels, and the patient put to bed between warm blankets with hot-water bottles. Nourishing food, such as beef tea, should be given, and he should be kept at rest and warm in bed till he is completely recovered.

POISONS

Poisoning.—A poison may be defined as a substance which, on being absorbed into the organs of the body or by chemical action on the tissues, injures health and destroys life. From this it will be seen that, short of actually causing death, a poison may have a very deleterious effect on the general health of the body, such as may lead ultimately to a state of chronic ill-health and even death. Cases of poisoning fall into two divisions—acute and chronic. It is usually the former which comes under the care of the renderer of first aid; the latter is more a case for a medical man from the beginning. Acute poisoning is due to the introduction into the system of a large enough dose of some poisonous substance to cause immediate danger to the life of the poisoned person. In such a case the only hope of successful treatment is in the quickness with which treatment suitable to the case is commenced. No time must be lost in waiting for a doctor; those who are on the spot must do all that they can to prevent the patient being dead when the doctor does arrive. Every moment that the poison is given to work its will in the body increases the danger. The number of poisons which kill instantaneously is comparatively small; most require a certain length of time for their action to reach its climax, and it is as a result of this highly fortunate circumstance that so much can be done, if it be done quickly. Cases of chronic poisoning, on the other hand, simulate as a rule some general disease, and require for their diagnosis and treatment skilled medical knowledge. In their case there is not the same paramount necessity for speed, though, of course, the sooner the cause of the complaint is dealt with the better.

First aid, then, in cases of poisoning is largely confined to those cases which are acute. Such cases arise in one or other of four different ways. Two of these are of the nature of accidents. In one the patient takes some substance by mistake which is not known to be poisonous. This may happen in several ways. Certain articles of food may have become noxious owing to improper methods of preparation or of keeping; or substances, which, though actively harmful, resemble closely others which are not only innocuous, but even beneficial, may be mistaken for the latter with disastrous results. Instances of this occur readily to everyone. The other class of accidental poisoning consists of cases where substances used medicinally in small doses are taken by mistake in too large an amount. A great number of drugs are of the greatest therapeutic value in small doses, which are active poisons when taken in greater amounts. An overdose of such a drug is highly dangerous, and is to be prevented at all costs. A common accident of this nature arises in cases where a bottle of medicine which requires to be well shaken before being taken is nearing the end, and the instruction as to shaking has been neglected. In such a case it may happen that the last few doses, though correct as to the amount of the mixture used, contain a much larger dose of the active principle than is intended, and alarming symptoms may follow on its administration. When a mixture bears the labels "Poison" and "To be well shaken" upon it, the greatest care must be exercised that it is well shaken on every occasion when it is used, and that the correct dose, neither more nor less, is given. Mistakes may also arise when mixtures such as liniments or embrocations, which are for external use only, are taken internally by mischance. Many drugs can be applied with safety and with great benefit to the external surface of the body which are highly dangerous when taken internally. In the taking of medicine too great caution cannot be exercised in seeing that the instructions are properly fulfilled.

The remaining two classes of poisoning are either suicidal or homicidal. To the person in a position to render first aid it matters very little how the poison has entered the body; his chief aim is to counteract its effect when it has gained entrance. Still, as such cases may be the subject of legal inquiry, and the person who is able to be of use at the time is likely to be called as a witness, it is advisable that he should add to his immediate usefulness by being able to help at the inquiry. This he can do by making careful note of all the circumstances of the case as it presented itself to him on his arrival. Nothing should be allowed to be removed save by the police or their officials: this especially applies to any food, bottles, or powders found in connection with the case. If any vomited matter is found, it should be preserved and handed over to the proper authorities. In these cases it is, unfortunately, often impossible to prevent a fatal issue, owing to the nature of the poison used and the large amount which has been taken. No effort, however, should be spared: success has often been achieved in cases which appeared hopeless.

The first thing to do in a case of poisoning is to send for a doctor at once. In the meantime much may be done to help the patient.

How is one to arrive at a diagnosis of poisoning? In many cases this is easy. The history of the case may be all that is needed. The person may have been perfectly well, when suddenly the symptoms made their appearance. The person may have taken a meal or some article of food or drink, or perhaps some medicine, a short time previously. In such a case an examination of the remains of the substance will clear up any difficulty. This is especially so in the second class of cases. If several people are more or less simultaneously attacked with alarming symptoms after they have all partaken of the same meal, there is a strong suspicion that it has been the cause of the symptoms. It is to be remembered, however, that not every one who has partaken is to be expected to show the same signs. One may have taken only a very little, not sufficient to do any harm, and another may have taken considerably more than one who appears to be suffering much more severely: people vary so much in their personal idiosyncrasies. In cases of suicide and homicide, while it is true that there is a great tendency to a follow-my-leader fashion in the particular drug used, it must always be remembered that the most unlikely and apparently absurd substances are occasionally employed. This is especially the case in cases of suicide in persons of weak mind, and in cases of homicide, where it is done to divert suspicion.

The first-aid treatment of a case of poisoning is to get rid of the poison from the body as soon as and where possible, and to counteract its effects by means of the appropriate antidote, as well as by treating the symptoms which arise. The poison is removed, as far as possible, by making the patient vomit (except in corrosive acid poisoning). For this purpose an emetic is used. An emetic is a substance which produces vomiting. In many cases this may be done mechanically by tickling the back of the throat. A feather may be used for this purpose, or, what is always at hand, the finger. Open the mouth wide, and keep it open by means of a gag of some sort; the handle of a knife, a piece of stick, or anything similar may be used. Pass the first finger well back into the mouth, and move it gently about over the upper part of the throat. This will be found effective in many cases. A draught of warm water may be all that is required; if nothing else is at hand, greasy water which has been used to wash dishes may be used. It is unpleasant and nauseating, which is exactly what is wanted, and is the lesser of the two evils by a long way. Two teaspoonfuls of common salt in a pint of warm water may be used, or a tablespoonful of mustard. Both may be used in turn. These remedies are usually at hand. Certain drugs have special emetic properties, and may be used. As a rule they act more quickly and effectively One of the commonest is sulphate of zinc, 30 grains of which should be given in a little hot water, the dose being repeated till vomiting is secured. A tablespoonful of ipecacuanha wine in water may also be used. When vomiting has begun, these same means must be continued till all the contents of the stomach have been evacuated and the water which is given returns quite clear. If one emetic proves useless, try another, when the combined effect of the two may prove efficacious. As will be seen later, *the only cases of poisoning in which an emetic must on no account be administered are those due to corrosive acids.* In other cases an emetic is always to be given. The best method of emptying the stomach of its contents is by means of the stomach pump. It is not, however, advisable that this should be used by anyone but a medical man. If the patient has not been made to vomit by the time the doctor arrives, he will probably proceed to empty the stomach by means of the syphon action of the pump. This, however, is rather beyond the sphere of first-aid treatment.

In a great majority of cases of poisoning the first thing to be done is, as already indicated, to get rid of the poisonous substance as quickly as possible by means of an emetic. This having been done, it may be advisable to secure a further elimination of the poison by means of an aperient. This causes the rapid transit of the noxious matter through the intestines, and deals with any that has got beyond the reach of the emetic previously administered. The commonest aperient is the old household remedy for all aches and pains, castor oil, a tablespoonful of which may be given, or even double that quantity. As this is a somewhat unpleasant preparation to take, great difficulty may be experienced in getting the patient to swallow it. A forcible method is to hold the person's nose and place the oil in the mouth; the person then swallows involuntarily, and the desired effect is obtained. A less barbarous method is to sandwich the oil between two layers of warm milk or alcohol. In many cases the action of the milk is beneficial, and in cases where there is collapse or fainting the alcohol acts as a stimulant. Another aperient usually to hand is sulphate of magnesia or Epsom salts. One or two tablespoonfuls of this should be given in a tumblerful of warm water.

In addition to the above special treatment the general principles of first aid must be carried out. Certain poisons tend to cause death by asphyxia, in which case one or other of the methods already shown of producing artificial respiration must be employed. Where there is much collapse, the patient must be restored as far as possible by the application of heat and friction to the extremities.

Antidotes.—An antidote is a substance which counteracts or antagonises the effect of a poison. Some antidotes act by rendering the poisonous substance inert and harmless, owing to the chemical union which takes place between the two substances; others, again, act by virtue of the effect they have on the different tissues of the body, so counteracting the effects of the poisons which have been taken. It will be readily seen that, as the actions of poisons differ the one from the other, so also must their antidotes differ. It is beyond the range of the first-aid student to know the actions of all the substances which may be used as poisons and such as may be used as antidotes. In many cases the two are the same. One poison may require the use of another, whose action is antagonistic to its own, as an antidote; a poisonous dose of the latter will demand the use of the former in its turn. All that the first-aid student requires is a compact and concise list of the appropriate antidotes, so that no time may be lost in the endeavour to find out what is the correct thing to give in any case. While a knowledge of the actions of the substances he is dealing with will make his work all the more interesting, it is not necessary for the efficient performance of his duty. Each of the more important poisons will be discussed and the treatment indicated; at the end of the section will be found a short table showing the antidotes to be given in each case.

An antidote has a specific action—that is to say, it is given for a special purpose, to neutralise the effect of a particular poison. This brings us to an important point, as will readily be seen. It is impossible to give an antidote unless the particular poison which is at work has been discovered. This, then, is one of the first things to be done—to discover, if possible, what poison is at work. The symptoms will in many cases gve as much evidence as is necessary; in others the history will enable a fairly correct diagnosis to be made; in yet a third class there will be found close to the patient some portion of the substance which has been taken. A word of caution in regard to the latter class is necessary. Cases are on record of persons attempting to commit suicide by poisoning who have exercised the greatest ingenuity in putting their friends off the scent by having at hand some poison whose action is different from that of the poison actually taken. As a result a wrong conclusion may be arrived at as to the cause of the patient's condition, and in consequence the treatment may not only be of little use, but even actually harmful. Such a mistake can, however, be avoided by a knowledge of the symptoms which a given poison should produce. The coolness which is essential to success in first aid, as in all medical work, will enable the possessor of the knowledge required to outwit even the cleverest schemes of the most determined suicide. The pity is, however, that in so many cases the dose has been so large that no treatment is of any avail. Treatment should never, on this account, be neglected; many persons have been rescued from the brink of the grave by the strenuous, though for a time apparently hopeless, efforts of those at hand. Whether it is desirable or not to rescue such a person from the consequences of his action is a matter which may be left to the theorists and moralists; the principle of first aid is to do whatever can be done to save a human life, irrespective of what that life may have been or may be.

The actions of many poisons are similar, or resemble one another in special points. Hence it is not unnatural to suppose that an antidote may be found of such wide action that it may be used in all cases of poisoning with a fair measure of success. Many combinations have been suggested. One of the simplest is pounded wood charcoal, which may be given in almost any quantity in water. This is especially useful in forms of poisoning arising from the ingestion of contaminated or tainted food, known as ptomaine poisoning, and in a great number of the animal and vegetable poisons. One of the best of all the formulæ given for a multiple antidote is that of Dr. Murrell, and is as follows:

Saturated solution of sulphate of iron .	100 parts
Water	800 ,,
Calcined magnesia	88 ,,
Purified animal charcoal . . .	40 ,,

This is a very useful preparation to be kept ready for use in all ambulance stations. Its efficacy depends to a large extent on its being properly prepared. The solution of the sulphate of iron should be kept in a bottle by itself, the magnesia and charcoal mixed together and kept in a jar or wide-mouthed bottle. When the antidote is required, one part of the iron solution is to be mixed with eight times its bulk of water, to which solution the other ingredients are added and the whole well shaken together. The usual dose is a wineglassful; more, however, may be given in serious cases. It will be found convenient to keep beside these stock bottles two measures, one to measure the iron solution and the added water, the other to contain the exact amount of the powdered compound necessary to go with the desired amount of the liquid solution. In this way very little time is lost in getting the antidote ready. The author mentioned claims that this will render harmless all preparations of arsenic, zinc, and digitalis, and will partly neutralise the actions of mercury, morphine, and strychnine. It will thus be seen to be very valuable in its action and of considerable scope. In cases of poisoning due to the alkalies, to phosphorus, antimony, and hydrocyanic acid, it is useless. Bearing this in mind, its use will be limited to such cases in which its action will be beneficial.

Classification of Poisons.—It is possible, from a practical point of view, to classify poisons according to their actions and consequent treatment in cases where they have been taken. For this purpose the simplest and at the same time most effective classification is that which divides poisons into the three main groups—corrosives, irritants, and narcotics. A fourth group may be added, the members of which possess the properties of the latter two. This group may be called the narcotic-irritant poisons. Each group has its distinctive features, which are easily recognisable.

Corrosives.—These poisons soften and destroy the parts with which they come in contact, and in this way do serious damage to the parts, usually the mouth, throat, and gullet. Mineral acids and caustic alkalies belong to this class, as do the acid, alkaline, and corrosive salts.

Irritants.—Here the parts are irritated or inflamed, such inflammation often leading to results as disastrous as, though less rapid than, in the previous group. Typical members of this group are arsenic, antimony, and phosphorus, the essential oils, and animal and vegetable poisons.

Narcotics.—Here the action is a remote one, no effect being caused on the tissues actually in contact with the poison. They act by being absorbed into the system, on the nervous system, and produce asphyxia, delirium, or convulsions. Notable examples are opium, belladonna, hydrocyanic or prussic acid, alcohol, and poisonous gases generally.

Narcotic-Irritants.—These have an irritating effect on the tissues in addition to their remoter effects on the nervous system. Such are strychnine, aconite, digitalis, and poisonous fungi.

Where the poisoning is due to a corrosive, always look for evidences of the corrosive action on the lips and in the mouth. Any signs of burning or corrosion in these regions, or on the skin of the face and neck, will indicate that a corrosive poison has been taken. This is of the greatest importance, as, owing to the damage which may have been done by the corrosive to the walls of the stomach, it is not safe to give an emetic. If the walls have been eaten into by the poison and so weakened, the giving of an emetic may cause a rupture of the stomach, with very serious, if not fatal, results. This is one of the most important points in treating cases of poisoning. In such a case the correct thing to do is to administer some substance which will help to protect the tissues from the action of the corrosive, and to soothe those which have already been injured. Such substances are demulcents, examples of which are milk, eggs, olive oil, and gruel. If there are no signs of burning or staining about the lips or face, it may be assumed that the poison is not a corrosive, or if such has been taken in so dilute a form as not to cause any immediate danger from its action on the tissues. In such cases an emetic should be administered.

Before proceeding to the detailed discussion of the various poisons, let us recapitulate the general maxims to be observed in any case which comes under our observation. As soon as it is ascertained that it is a case of poisoning, send a messenger for a doctor, informing him at the same time of the nature of the poison. This will enable the doctor to select the appropriate remedies. Till the doctor arrives, if the nature of the poison has not been ascertained, act on the general principles already explained. Get rid of the poison as quickly as possible by means of an emetic, except where there is staining or burning of the lips or mouth, or by giving an aperient. If there is shock or collapse give stimulants, such as sal volatile, spirits, strong tea or coffee, and keep the patient warm by means of hot cloths, poultices, fomentations, or the like. Pain can be relieved by applying warmth and demulcents. If the poison is known, the special treatment appropriate is to be adopted, always bearing in mind the golden rule of first aid, to avail oneself of the first thing that comes to hand that is likely to be of any use as a remedy.

Acetic Acid.—From the strong or glacial acetic acid, which is used to destroy warts, we have many gradations of strength down to the ordinary household vinegar. Poisoning is rare, and is due to the taking of the strong acid by mistake, or to the use of vinegar under the impression that it prevents corpulence. The strong acid would act as a corrosive, and so cause staining or burning of the lips and mouth. The odour of vinegar would be very strongly in evidence, and there would be severe pain in the abdomen. The diagnosis is usually easily made from the smell of the acid.

Treatment.—Owing to the corrosive action no emetic should be given. It is best to give a drink of soap and water as soon as possible. This acts best if given immediately after the acid has been taken. Follow this up by giving chalk and water, or whitewash and water. Chalk may be obtained from the plaster on the walls or from the ceiling. Some demulcent, as milk, oil, or gruel, may be given to soothe the corroded surfaces in the mouth and gullet.

Acids.—These substances are the typical examples of corrosive poisons. They corrode and destroy the tissues with which they come in contact, the severity of the damage being in proportion to the strength of the acid. They cause instant burning pain in the mouth and throat, there is severe colic in the stomach, while in severe cases vomiting and purging may be caused. These latter two are helpful, though very painful, as they tend to expel the poison from the stomach, and prevent its absorption into the system. The strain of the vomiting may, however, be too much for the injured walls of the stomach, which may give way in consequence. These acids burn the lips, tongue, and mouth : such burning is very strong evidence that some corrosive poison has been taken. The patient suffers from severe shock, is collapsed, the extremities are cold, and the body is bathed in a cold, clammy sweat ; there is great thirst.

Treatment.—On no account must an emetic be given in cases of poisoning by acids. Some bland demulcent must be given to protect and soothe the tissues : oil of any kind should be given for this purpose, or white of egg and milk. The antidotes to such acid poisoning are the substances known as alkalies, the most convenient of such being carbonate of soda or ordinary baking soda, lime, and chalk. These may be given freely in large quantities. Each of the important acids will be considered separately under its own name.

Aconite.—This is a highly poisonous substance which is used medicinally both for internal and external application. It is derived from the monk's-hood or blue-rocket, a common garden flower, which is highly poisonous. The leaves may be eaten by mistake, as may also be the roots.

It is a favourite remedy for neuralgia, and may be taken by mistake as the liniment. The symptoms consist of a tingling of the mouth and throat, which latter appears to be constricted as by a band. There is frequent swallowing, and the tingling spreads throughout the whole body, which ultimately becomes numbed. Sensation becomes lessened; the special senses are affected, especially the eyes and ears. The patient becomes blind and deaf. The limbs become paralysed, the lower before the upper. The respirations become shallow and feeble. The pupils become dilated, except in cases where there are convulsions. Although the bodily symptoms are very severe, the mind usually escapes, and is clear to the end. The patient is conscious of his approaching end, which is ushered in with cold perspirations, and often comes with surprising suddenness. The picture of such a one is thoroughly distressing.

Treatment.—Administer an emetic at once, either mustard and water, or zinc sulphate, or ipecacuanha wine. As there is great collapse, stimulants must be freely given. Brandy, whisky, or sal volatile may be given. In cases where it is impossible to administer such by the mouth, or where they are not retained by the stomach, they must be given by means of an enema. The extremities must be kept warm by means of hot cloths or hot-water bottles or heated bricks. Warmth may also be excited by rubbing with a rough towel or by massage with the hands. In severe cases a mustard and linseed poultice must be applied to the chest over the heart. The patient must be kept lying down, as the slightest exertion may cause sudden heart failure. If there is much collapse, it may be necessary to have recourse to artificial respiration. The antidotes are atropine and digitalis. The former may be given by the mouth or by an enema as thirty drops of the tincture of belladonna. The latter may be given in the form of the tincture, twenty drops being given, and repeated in half an hour if necessary. Both may, of course, be given hypodermically.

Aconite and Belladonna.—This combination occurs in the well-known liniment, which may be taken internally by mistake. The symptoms would resemble those described above for aconite alone, but to a lesser degree, as belladonna is an antidote to aconite. The treatment is the same as for aconite alone.

Alcohol.—Acute alcoholic poisoning is the last stage of a drinking bout, and all degrees of the poisoning may be seen. The stronger spirits, such as rectified and proof spirit, as well as methylated spirit, may be taken by mistake, or even a seasoned toper may, owing to his being in a poor state of health, succumb to a quantity of liquor much below his normal quantum. The usual evidences of drunkenness are present to a marked degree; the flushed face, unsteady gait, confused thought and speech, and cold sweats of the drunk man are only too well known. In more serious cases there may be convulsions or stupor, either of which may end in death. In some cases the patient may appear to recover for a time, and death may supervene suddenly from delayed alcoholic poisoning. The diagnosis is not always easy. A man found unconscious may be suffering from drink, apoplexy, epilepsy, opium poisoning, concussion, or in the last stages of diabetes or of kidney disease. Even the odour of spirits in his breath is no certain indication that that is the cause of his condition. In all such cases the greatest care must be exercised, and if it cannot be proved that drink is the cause of the condition, it is wisest to proceed on the assumption that the cause is a more serious one, and treat the case accordingly. Even a man who is unconscious merely from alcohol is in a dangerous condition, and should on no account be left in a prison cell to sleep it off. In the section on Insensibility the differences between the various states of unconsciousness are set forth and the suitable treatments indicated.

Treatment.—Alcohol is a narcotic poison, and acts on the nervous system. It must be eliminated as soon as possible by means of an emetic of mustard, sulphate of zinc, or ipecacuanha wine. If the patient is unconscious, he should be roused and kept awake by any means that can be thought of. Flap him with wet towels, pinch his arms and legs, and generally make sleep as uncomfortable for him as possible. Pour cold and hot water alternately on his head, and stimulate him by massage. The special antidote is hot, strong coffee, given either by the mouth or by means of an enema. If there is great collapse, it may be necessary to apply artificial respiration. When the patient shows signs of recovery and has become conscious, put him to bed, well wrapped up in warm blankets, with hot-water bottles to his feet.

Almonds, Oil of Bitter.—This is also known as the essential oil of almonds, and is a volatile oil obtained from bitter almonds. The poisonous principle is hydrocyanic or prussic acid—a very deadly poison indeed, but the proportion is small. It is used as a flavouring agent for domestic purposes, and may be mistaken for the similar oil prepared from sweet almonds. The symptoms and treatment are the same as those of hydrocyanic acid, which see.

Ammonia, Spirits of Hartshorn.—Solutions of ammonia are used in households for purposes of cleansing, and may be taken internally by mistake. Sal volatile may be used in cases of shock or fainting in too large doses, and some persons exhibit a peculiar susceptibility to the drug, so that a very small dose may cause serious symptoms. Mere inhalation of a strong vapour may cause symptoms of poisoning. There is a burning pain in the mouth, nose, and throat; the lips and tongue become parched and swollen. There is intense pain in the chest and stomach, and the patient suffers very severely. There may be a troublesome cough and vomiting, the contents of the stomach being mixed with blood. The patient becomes pale and collapsed, and has an anxious look. The extremities become cold and clammy. Owing to the irritation of the mouth and throat the parts become swollen and inflamed, so much so that there may be serious interference with the breathing, and a state of asphyxia is induced. In such a case it may be necessary to make an opening into the windpipe and perform the operation of tracheotomy. Death may ensue rapidly from this cause, or may be delayed for a few days and be due to some complication in the chest. For this reason the greatest care must be taken of any person who has apparently recovered from poisoning by ammonia:

the person should be under constant medical supervision. A further complication may be due to the destruction of parts of the gullet and stomach, giving rise to an obstruction in the former and an ulcer in the latter. The breath, as a rule, smells strongly of the ammonia.

Treatment.—The antidote to ammonia is an acid. The most convenient and most likely to be available is vinegar, which should be well diluted with water. Any weak acid which is at hand may be used, but always in a very weak solution. Failing this, the juices of oranges or lemons may be used. Remember that toilet vinegar will also serve the purpose required. To soothe the injured tissues give some demulcent fluid, such as white of egg and water or milk, olive oil or any other oil which is at hand, gruel, or arrowroot. If there is difficulty of the breathing, a few inhalations of chloroform may be given, pending the arrival of the doctor, or the steam from a bronchitis kettle may be inhaled. The usual precautions against shock must be observed, the patient being kept low and warm.

Antifebrin or Acetanilid.—This substance is commonly used in headache powders, too great a quantity of which may be taken in cases of severe headache or neuralgia. It has a depressing effect, the patient becoming weak and faint. There is a feeling of giddiness, with noises in the ears and pain in the head. There may be vomiting and purging. The breathing is affected, becoming slow and laboured. On this account the face becomes livid and blue, and there is much sweating. Various rashes may appear on the body, and the limbs become tremulous and exhibit convulsive movements.

Treatment.—Administer an emetic—a tablespoonful of mustard in a tumbler of warm water, or double that quantity of salt. Keep the patient in the recumbent position, and apply warmth to the body. Stimulants, in the form of tea, coffee, or spirits, may be necessary.

Antimony, Tartar Emetic.—Tartar emetic is used medicinally: an excessive dose may be taken by mistake or given by design. It may be mistaken for Epsom salts or for common salt. It is contained in Hooper's or Hall's Specific. There is a metallic taste in the mouth, a feeling of sickness, and severe vomiting. The throat appears to be choked, and swallowing is rendered difficult. There are violent pains in the stomach, and there may be purging. The arms and legs become cramped; their surfaces are cold and covered with clammy sweat; the face becomes very congested. There is much depression and weakness, the pulse becomes weak and feeble, the breathing is embarrassed and feeble, and death follows on collapse.

Treatment.—In the majority of cases there is severe vomiting, but some are found in which it is altogether absent. Even where present it is advisable to aid the expulsion of the stomach contents by giving emetics. When the vomiting results from the action of the tartar emetic, it should be aided by giving large draughts of warm water. Strong tea or coffee may also be given, and soothing substances, as milk, white of egg, gruel, or arrowroot. The patient must be kept warm, and, if necessary, stimulated by means of brandy or whisky. The specific antidote is tannic or gallic acid. Half a drachm—that is to say, a tablespoonful—of either should be given. If it is vomited along with the other contents of the stomach, the dose should be repeated, and a like procedure adopted after each act of vomiting. A decoction of oak bark contains the antidotal acid, and may be used with success.

Antipyrin, or Phenazone.—This is a white powder, used largely for the relief of headache or neuralgic pains generally. Cases of poisoning have occurred where an excessively large quantity has been taken to relieve pain. The symptoms are pain in the stomach, with retching and vomiting. The pulse becomes weak, the breathing is rapid, and a condition of asphyxia may develop in consequence of the embarrassed breathing. There may be great swelling of the face, neck, and eyelids, much sneezing, and copious watery discharges from the nose and eyes. When very large doses have been taken, the drug ceases to relieve the headache or neuralgia for which purpose it is used: on the contrary, it causes intense headache, with giddiness and sleepiness. The memory becomes affected, and the mind is much confused. In some cases a peculiar rash makes its appearance on the face and body, accompanied by intense itching. People vary in their susceptibility to this drug, so that there may be great differences in the symptoms and in the severity of the poisoning. Collapse may in certain cases set in with startling suddenness, and a fatal issue ensues rapidly.

Treatment.—An emetic is advisable. Any of the already mentioned emetics may be given with success, and the patient must be treated for shock by being kept in the recumbent position, by having warmth applied to the extremities, and by stimulation if necessary. Free access of pure air should be secured, and in cases where the asphyxia is extreme it may be necessary to have recourse to artificial respiration.

Arsenic, Arsenious Acid, White Arsenic.—This is one of the most commonly used poisons, and is a highly dangerous substance. It is used medicinally in small doses, and is a valuable tonic. In certain diseases it has an almost specific action. It is widely used for commercial purposes, being found in some coloured paints or washes, in sheep washes, in rat pastes and vermin killers, in fly-papers, in the manufacture of fireworks and coloured lights, and in stuffing birds and animals. It is said to possess the property of making the complexion clear and beautiful. This is, however, a popular superstition: it may have some such effect on account of its tonic action. Chronic arsenic poisoning is not infrequently found in certain occupations, while epidemics of acute poisoning from arsenic have occurred, owing to its presence in other substances which have been improperly prepared or insufficiently purified. The symptoms usually come on rapidly, generally in considerably less than an hour. The patient feels faint and weak, and there is a burning pain in the stomach, with retching and vomiting. The vomited matter is usually brown in colour, and mixed with blood. There may also be severe purging, the motions being also bloodstained. Severe cramps are felt in the legs, the calves being especially affected. The pulse becomes small, weak, and irregular. There is a feeling of constriction in the throat, with great thirst, and the breathing becomes painful. The skin becomes cold and clammy with perspiration, and there is severe collapse, and, in serious cases, death. In some cases a rash may appear on the skin. If the poison is taken some time after a meal, when the stomach is empty, its action is much more rapid and more severe than when taken on a full stomach. In the latter case there is much more chance of its being rapidly ejected along with the contents of the stomach.

Treatment.—First of all an emetic must be given, either mustard and water or sulphate of zinc, a tablespoonful of the former or a small teaspoonful of the latter. Quantities of greasy water or of soap and water may also be given, and the whole of the poison thus removed from the stomach. Oily substances should be given to soothe the irritated tissues—olive or castor oil, or the mixture of equal parts of linseed oil and limewater known as carron oil and used for burns. Demulcent drinks of white of egg or barley water should also be given. The collapse must be treated by means of warmth, the recumbent position, and stimulants if necessary. The antidote is iron. The best form in which to give this is what is known as dialysed iron: this is formed by mixing two tablespoonfuls of the tincture of the perchloride of iron with the same quantity of washing soda in a tumblerful of water and filtering the precipitate. It is best given in hot water, and may be administered in large quantities. Failing this, magnesia is the next best antidote.

Aspirin.—This substance is largely used medicinally for headaches, colds, and rheumatism. An overdose may occasion alarming symptoms, while in specially susceptible persons the drug causes so much sickness and nausea that it cannot be taken. In cases where an excessive dose has been taken or administered, the face becomes enormously swollen, as are the lips and tongue, the latter so much so that it cannot be protruded. The eyelids become so swollen that the eyes are closed up, and, owing to the swelling of the throat, speech becomes difficult and there is great interference with the breathing. The whole body experiences a tingling or burning sensation, the upper portions of it being covered with dark wheals. The pulse becomes small and rapid, and the patient may lose consciousness.

Treatment.—If the swelling is not so great as to prevent swallowing, give a mustard and water or other emetic and apply fomentations to the neck. If there is serious interference with the breathing, it may be necessary to perform artificial respiration, while in extreme cases, owing to the swelling of the throat and larynx, it may be necessary to have a medical man to perform tracheotomy.

Belladonna, Atropine.—This drug is obtained from the plant called the Deadly Nightshade. It grows principally on a lime soil, and is not very common, preferring shady places under hedges in country lanes. Its flower is of a dark purple colour, and the berries, about the size of a small cherry, have a deep groove down the centre and are of a shiny black colour. This plant may be confounded with either the woody or the garden nightshade, the former of which has a purple flower and red berries, the latter having a white flower with black berries. These berries are often eaten by children: the latter two are not nearly so dangerous as the first. The leaves have been made into an infusion by mistake, and poisoning caused in this way. Belladonna is largely used in liniments intended for external use only: poisoning has occurred from drinking such either by accident or design. The plant contains two poisonous substances, atropine and hyoscyamine, each of which is used in medicine. The symptoms of poisoning by either of these are much the same as by belladonna itself. The mouth becomes extremely dry and the thirst is intense. All the secretions are stopped, especially saliva. There is great difficulty in swallowing. The face becomes flushed and the eyes prominent. The condition of the pupils of the eyes is characteristic: they are widely dilated and have a sparkling appearance. Vision becomes blurred and indistinct. The patient becomes wildly excited and may be delirious. The muscles become weak, and the gait is unsteady and tottering, the person falling down in his endeavours to walk. There is a varying degree of irritation of the bladder, causing a repeated desire to urinate, with, however, no ability to do so. The skin becomes dry, and may exhibit a rash very like that of scarlet fever.

Treatment.—Speedy treatment, even in very severe cases, is here attended with marked success. Deaths from belladonna poisoning are comparatively rare. An emetic should be administered at once, mustard or salt and water if no other emetic substance is at hand. The patient should be roused as much as possible by any means available. He may be flicked with a wet towel or have douches of hot and cold water alternately. Blisters may be applied to the legs and hot-water bottles to the feet. If it appears necessary, artificial respiration must be employed, and may have to be continued for a long period of time. Stimulants may be given—tea or coffee, brandy, or sal volatile. A good method is to inject a pint of hot coffee into the rectum. The antidote to belladonna is the drug known as pilocarpine. This may be given as the tincture of jaborandi, two teaspoonfuls of which may be given. Fomentations should be applied to the lower part of the abdomen to allay the irritation of the bladder and hasten the discharge of the urine.

Benzol, Benzin.—This highly inflammable substance may cause symptoms of poisoning owing to its vapour being inhaled during the process of its manufacture. It may cause signs of chronic poisoning in cases of workmen employed in its manufacture, or in cleaning and dyeing works, where it is largely used. The acute cases are due to the inhalation of the vapour, which acts as a narcotic poison. There are noises in the head and ringings in the ears. The muscles and then the limbs undergo twitchings which may progress to actual convulsions. Breathing becomes difficult, and the patient may become asphyxiated.

Treatment.—If swallowed, it should be got rid of by means of an emetic. The patient should be removed from the source of infection, if the poisoning is due to the vapour, and placed in a position where he can get a good supply of pure fresh air. Artificial respiration must be employed, and he may be given ammonia to inhale when the breathing is returning. Douches of hot and cold water should be given, and stimulants by the mouth if possible; if not, coffee should be injected into the rectum. Fomentations may be applied over the heart, or a mustard blister.

Blue Vitriol, Blue Stone.— *Vide* Copper.

Bryony.—This plant is found growing wild in all parts of the country, being found especially in hedges by the roadside, where it is seen by children. The red berries are picked and eaten, sometimes with disastrous results. The symptoms are giddiness and faintness, sickness and vomiting, with severe purging and occasionally delirium.

Treatment.—Give an emetic of mustard or salt and water, and repeat till the stomach is washed out. The usual treatment of collapse and shock must be adopted, the patient being kept warm and stimulated with brandy or sal volatile. A good dose of castor oil should be given when the vomiting ceases.

Caffeine.—This drug is employed principally to relieve headaches and neuralgia, either alone or, more commonly, in combination with some other drug or drugs. It occurs in coffee, and to a smaller extent in tea. An overdose may cause serious symptoms. There is burning pain in the mouth, throat, and gullet; the patient becomes faint and giddy, is sick, and has severe pains in the stomach. The tongue becomes dry, and there is great thirst. The arms and legs become weak and tremulous, the pulse is weak, the skin cold and clammy, and a state of collapse sets in. Large quantities of urine are passed.

Treatment.—Give an emetic, mustard or salt and water, and combat the collapse by applying warmth and friction. Stimulants should be given—spirits or sal volatile are the best: tea and coffee should be avoided, as they contain caffein as an active principle. The antidote is morphia, combined with atropine, which should be given hypodermically.

Camphor.—This is used in lumps to protect clothes from moths, &c., and is also medicinally in oil and liniment. Children may eat a camphor ball which has come into their possession, or the medicinal preparations, intended for external use, may be taken internally. The patient has a strong odour of camphor in his breath, becomes faint and giddy, has noises in the ears and dimness of vision. The features become sunken, the skin is cold and clammy; there may be delirium and convulsions. The bladder is irritated, and there is increased desire to pass urine. The pulse becomes weak and the breathing laboured. The patient may go off into a long sleep and wake much recovered. Pain is hardly ever present; there is neither vomiting nor purging.

Treatment.—Give an emetic, and treat the collapse by applying warmth. Stimulate by means of hot and cold douches, and give hot coffee by the rectum. It is not advisable to give spirits by the mouth, as camphor is readily soluble in spirits, and is thus more easily absorbed.

Cantharides, Spanish Fly, Fly Blister.—This is the powdered wings of beetles, and is supposed to have an aphrodisiac action. This is erroneous, the chief action being to irritate the kidneys. It is used as a blister and also in hair-washes. It is a highly irritating substance, and when taken internally causes a burning sensation in the mouth and throat, with much pain on swallowing. It causes vomiting, the vomited matter being mixed with blood as well as the shining particles of the powdered leaves. There is also purging, with blood in the motions. The kidneys are irritated, and there is increased desire to pass urine, but only a few drops of bloody urine are passed. In severe cases there is great abdominal pain, weak pulse, headache, convulsions, and finally death ensues.

Treatment.—Give an emetic, using any of the substances already mentioned. Demulcent drinks must be given to allay the irritation—milk, white of egg, gruel, or barley water. Oil should not be given, as it will help the absorption of the poison into the system. Hot fomentations or poultices should be applied to the abdomen to relieve the pain. For this reason also some opiate may be necessary: half a teaspoonful of laudanum may be given.

Carbolic Acid.—This is probably the commonest of all poisons: it is widely used as a disinfectant and is easily obtained. It is often taken by mistake, owing to careless habits of keeping it. It causes intense burning in the mouth and throat and in the stomach. The lips and mouth are burned, having a white stain, and become dry and hard. The skin becomes cold, and is covered with cold perspiration. As a rule there is no vomiting: in many cases it is only with the greatest difficulty that vomiting can be caused. There is not much urine passed: what is usually has a dark colour, and becomes black on being allowed to stand exposed to the air. The patient may become insensible, with laboured breathing and a weak pulse. A peculiar characteristic is that death may ensue suddenly after an apparent recovery.

Treatment.—An emetic may be given in this case, followed by demulcent drinks of milk, white of egg, or gruel. It is not advisable to give oils, as the poison is very soluble in oily solutions. The body must be kept warm by means of hot blankets and hot-water bottles, and by friction. Stimulants should be freely given, preferably by injection into the rectum. If the breathing becomes very embarrassed, artificial respiration must be employed.

Chloral.—This is much used as a sedative, either alone or coupled with other sedative drugs. Serious symptoms supervene on the taking of a large dose or on the repeated taking of small doses, owing to its cumulative effect. It is then a narcotic poison, and the symptoms are those of such a poison. The patient falls into a sound sleep and becomes limp. The face becomes congested and bloated, the pulse is weak and slow, the breathing is also slow and laboured, and finally may cease altogether. The pupils of the eyes are dilated. The body becomes very cold and clammy, and the skin may show an eruption.

Treatment.—Give an emetic. Keep the body as warm as possible with hot flannels, hot-water bottles or bricks, and friction, either with the hands or with a rough towel. The patient must be roused from his sleep by flicking with a wet towel, by punching or pinching him, by applying blisters to the legs, and by any other means that suggest themselves. Stimulation is best carried out by injecting hot coffee into the rectum, or by hypodermic injections of strychnine. If death is threatened from the rapidly failing breathing, artificial respiration must be performed.

Chlorodyne.—This is a preparation of great value in medicine, and one much abused by indiscriminate use by well-meaning though less well-informed persons. An overdose causes symptoms of narcotic poisoning, the most actively dangerous substance in its composition being morphia. The symptoms and treatment are those of a narcotic poison, more especially those of morphia, which see.

Cocaine.—This substance is used as a local anæsthetic in cases of minor operations. Owing to the danger attached to its use in susceptible persons it is not now so commonly used as formerly, being superseded by some similar but harmless preparations. It is still used in dentistry and in ophthalmic work. Of recent years, also, it has become a habit amongst a certain class of people to inject cocaine, a highly dangerous and undesirable proceeding. Persons who exhibit the peculiar susceptibility to the drug should never allow it to be used on them, and should, if necessary, always inform their doctor or dentist, as the case may be. The symptoms of cocaine poisoning are faintness and giddiness, the face becoming pale, the pulse weak and rapid, great prostration and collapse, pains in the back especially, with much mental excitement, and ending in delirium or convulsions.

Treatment.—If swallowed, an emetic must be given. In all cases the collapse must be dealt with by the application of warmth and the administration of stimulants. If necessary, artificial breathing must be performed.

Colchicum, Autumn Crocus, Meadow Saffron.—Colchicum is obtained from the plant Meadow Saffron, all the parts of which are poisonous. The leaves may be eaten by children or a harmful dose of the medicinal preparation may be taken by mistake. It is given for the purpose of procuring abortion, and may cause poisoning in this way. Here it may be stated that there is no drug known to medical science which can procure abortion without poisoning the patient and seriously endangering her life. Were this fact better known there would be less sale of such preparations, and a nefarious trade would soon cease to exist. Colchicum wine has been taken in mistake for sherry, which it somewhat resembles in appearance. It causes great irritation to the mouth and throat, burning pain in the stomach, with sickness and vomiting, purging—the motions being stained with blood—and great prostration. There is profuse sweating, the pupils of the eyes are dilated, the pulse is weak and rapid, there are cramps in the legs and arms, and ultimately delirium.

Treatment.—Give an emetic of mustard or salt and water, and demulcent drinks—milk, white of egg, barley water, or gruel. Keep the body warm, and give stimulants, such as brandy or strong coffee. The antidote is tannic or gallic acid, which may be given in teaspoonfuls, or strong tea.

Colocynth, Bitter Apple.—This is another substance which is used to procure abortion, but is more likely to cause death. It causes severe vomiting and purging, the motions being stained with blood. The pulse becomes weak, the body, and especially the extremities, cold and clammy. There is great collapse, and in many cases rapid death.

Treatment.—Give an emetic and demulcent drinks. Keep the patient warm by means of hot blankets, hot-water bottles, and friction. Poultices may be applied to the abdomen. The antidote is camphor. Give ten drops of the spirit of camphor or five of the essence in milk or in sugar, and repeat if necessary.

Conium, Common Spotted Hemlock.—This plant is found growing wild in hedgerows, and resembles parsley, for which it is often mistaken. It should, however, be easily distinguished owing to its mousey smell. It causes first of all weakness of the legs, which gradually extends upwards. The patient staggers about, and, as the weakness extends, loses all power in his body and arms. The pupils of the eyes are dilated, the sight becomes dim, swallowing becomes difficult and then impossible, the breathing gradually becomes more and more embarrassed, and finally the patient is asphyxiated.

Treatment.—Give an emetic as already indicated, and stimulate by means of brandy or sal volatile. Keep the body as warm as possible, using every means which can be thought of. The antidote is tannic or gallic acid, or decoction of oak bark. Failing these, strong tea should be given, and if the breathing shows signs of weakness perform artificial respiration.

Copper.—This may be taken by accident or design. It is given to procure abortion, with the same degree of success as any other arbortifacient. The commonest cause of copper poisoning, however, arises from the contamination of foods which have been cooked in copper pots. All copper utensils used for cooking should be lined with tin, and on no account should food be left standing in copper vessels. Verdigris in copper vessels is another source of poisoning. In addition to these cases of acute poisoning, there is also a chronic copper poisoning in persons who are constantly exposed to the action of the metal. The symptoms of the acute poisoning are a metallic taste in the mouth, with a feeling of tightness in the throat, colicy pains in the stomach, sickness, and vomiting. There is great thirst, the pulse is small and rapid, the body becomes cold and collapsed.

Treatment.—Give an emetic with large draughts of warm water. Demulcent drinks should be given—milk, white of egg, gruel, or barley water. If the pains are very severe, a hypodermic injection of morphia may be necessary, or half a teaspoonful of laudanum may be given by the mouth. The body must be kept warm, and the usual treatment of collapse performed.

Corrosive Sublimate, Perchloride of Mercury.—This is a strong antiseptic, and is much used as a disinfectant. Solutions may be taken internally by mistake, and serious symptoms have resulted from the use of too strong a solution in dressing wounds. The symptoms are those of a metallic poisoning. There is a metallic taste in the mouth, with a feeling of constriction in the throat. There is much pain in the stomach, and sickness and vomiting. There is severe purging, the motions as well as the vomited matter being stained with blood. The lips and tongue are stained white. The pulse is small and rapid. The skin becomes cold and clammy, and the breathing is laboured. There is severe shock, and death may be ushered in by convulsions.

Treatment.—Give an emetic and stimulate freely. Treat the collapse in the usual way. Give demulcent drinks to soothe the tissues. The antidote is white of egg or egg albumen. Mix this with water, and give in large quantities. Repeat the emetic after giving the antidote.

Croton Oil.—This is an intensely powerful purgative, and may be taken in mistake for castor oil, or the liniment may be taken internally. It causes intense pain in the stomach, with vomiting and severe purging, with watery motions. The face becomes pale and pinched, the pulse small and rapid, and the skin cold and clammy. There is great collapse.

Treatment.—Give an emetic and demulcent drinks freely. Stimulants will be necessary to combat the shock, and poultices to the abdomen to relieve the pain. Half a teaspoonful of laudanum should be given by the mouth, or a hypodermic injection of morphia. The antidote is camphor. Give ten drops of the spirit or five of the essence in milk or on sugar, and repeat the dose if necessary.

Cyanide of Potassium.—This is a powerful poison, being allied to prussic or hydrocyanic acid. It is used in photography and in certain plating processes. The symptoms appear almost immediately, and are very severe. There is great pain and burning in the stomach, and foaming at the mouth. The limbs become weak and powerless, and ultimately exhibit convulsive movements. The breathing is affected, becoming very irregular. There are spasms of the muscles, causing stiffness of the jaws and body generally, and death ensues rapidly.

Treatment.—Give an emetic and stimulate freely. If the power of swallowing be lost, hot coffee with brandy must be given by the rectum. Hot and cold douches should be given, and artificial respiration if the breathing shows signs of failing. The antidote is sulphate of iron, known as green vitriol. This must be given in large quantities in water.

Digitalis, Foxglove.—Digitalis is a drug prepared from the plant Foxglove, which grows wild in this country and is also cultivated in gardens. It is largely used in medicine and also by quacks. The symptoms of an overdose are vomiting of green-coloured water and severe purging, with pain in the abdomen. The heart is chiefly affected, the pulse becoming slow and irregular. The great danger is sudden failure of the heart's action. The pupils of the eyes are dilated, there are pains in the head, the skin becomes cold, and sweating is profuse. The urine is suppressed, and delirium may pass on to convulsions and death.

Treatment.—Give an emetic of mustard or salt and water. The action of the heart must be improved by stimulants, such as spirits or sal volatile. Ten drops of the tincture of aconite may be given, and the patient must be kept strictly in the recumbent position for some time after the recovery is apparently complete. This is owing to the fact that any strain on the affected heart may cause a sudden cessation of its action, with resulting death. The antidote is tannic or gallic acid, half a teaspoonful of which should be given. Failing this, give plenty of strong tea or coffee.

Ergot.—This drug is given in the vain hope of procuring abortion. This can only be done by doses of such quantity as to cause serious ergot poisoning. Bread made with certain forms of rye may contain ergot in sufficient quantities to cause symptoms of chronic poisoning. The symptoms commence with tinglings in the hands and feet, then cramps in the arms and legs. The body feels cold all over, the pulse is small, and the pupils of the eyes are dilated. There may be sickness and vomiting as well as purging.

Treatment.—Give an emetic and also an aperient, either castor oil or Epsom salts. Stimulants should be given, and the patient kept warm in the recumbent position. The antidote is tannic or gallic acid in half-teaspoonful doses, or strong tea or coffee.

Exalgin.—This drug is used for headaches and neuralgic pains. When too large a dose is taken there is experienced a tingling or numbness of the arms and legs. Much saliva is secreted, and vomiting is the rule. The patient becomes flushed and has great difficulty in breathing. The head feels as though it were about to burst.

Treatment.—Give an emetic, and stimulate as freely as possible. A hypodermic injection of strychnine may be necessary.

Food Poisoning.—This may be caused in many ways. The food may have developed poisons in itself (these are known as ptomaines), or, owing to its incorrect preparation or keeping, some form of poison may be introduced into it. Substances which are noxious may be taken as foods by mistake for perfectly harmless products, or foods which in themselves are harmless may become poisonous owing to contamination. In most of the cases the symptoms are the same. There is severe pain in the abdomen, with vomiting and diarrhœa. The patient is collapsed, the skin cold and clammy, the pulse small and rapid. The prostration may be very great, depending largely on the severity of the vomiting and diarrhœa.

Treatment.—In all cases an emetic should be given, followed by an aperient. A good aperient to give is an ounce of castor oil with which has been mixed twenty drops of chlorodyne. Even when there is much vomiting it is advisable to give an emetic to clear the stomach out thoroughly. The patient should be put to bed and warmth applied to the arms and legs. Poultices should be applied to the abdomen, and stimulants freely given.

Gelsemium.—This drug is obtained from the yellow Carolina jasmine, and is used in medicine. It is also used in many quack preparations, and also to procure abortion. The symptoms of poisoning are pain in the forehead and eyes, giddiness, and dimness of vision. The eyes cannot be properly opened, as the upper lids tend to hang downwards. A further peculiarity of the effects on the eyes is that everything is seen double. The legs become weak and helpless, the patient rolls about from one side to the other as he walks. There is much difficulty in breathing, the chest feels suffocated, there is foaming at the mouth, and finally a condition of asphyxia ensues.

Treatment.—Give an emetic if the case is seen early; if not for some considerable time, it is not advisable. The antidote is atropine, which may be given hypodermically or as tincture of belladonna, half a teaspoonful, by the mouth. The patient must be stimulated, and the hot and cold douches applied alternately to the head and chest. If the breathing is seriously affected, perform artificial respiration.

Hydrochloric Acid, Spirits of Salt, Muriatic Acid.—This is not a very common cause of poisoning. It may be taken in mistake for beer or brandy. The symptoms are those of a corrosive poison. Intense burning pains in the mouth, throat, and stomach, vomiting of brown matter mixed with blood, great thirst, and difficulty in swallowing, are the typical features. The skin is cold and clammy, and beads of perspiration stand out The pulse is weak and rapid, and there is great collapse. Death may ensue rapidly, or may be delayed for some days or even weeks. Hydrochloric acid leaves a whitish stain on the lips and tongue.

Treatment.—This being a corrosive poison, an emetic should not be given. The antidotes are the alkalies. Give large amounts of soap and water, followed by soda and water. Ordinary baking or washing soda may be used. Lime-water may be given, chalk from the walls being used if there is nothing else to hand. Demulcent drinks must be given to soothe the corroded tissues—milk, white of egg, oil, or gruel. The patient should be kept as warm as possible.

Hydrocyanic Acid, Prussic Acid.—This is one of the most powerful poisons known to medical science, and is especially dangerous owing to the extreme rapidity of its action. Cases of fatal poisoning have been recorded from the inhalation of the fumes of the strong acid. The symptoms come on almost as soon as the acid is placed on the tongue, even before it is swallowed. The patient becomes giddy and loses the power of his legs. The eyes become fixed and staring, with large dilated pupils. The pulse becomes weak and is almost lost, the skin is cold and clammy, and the patient becomes rapidly unconscious. The breathing is peculiar: there are violent gaspings, as though it was impossible to get a proper supply of air to the lungs. The condition may go on to convulsions and rapid death. It is said that, when a fatal dose has been taken, unconsciousness comes on in less than two minutes.

Treatment.—In no case of poisoning is rapidity of treatment so absolutely essential to success as in this. If the patient can only be kept alive for half an hour, there is every prospect of a complete recovery. To this end every means must be adopted. While an emetic to clear the stomach of the poison is clearly indicated, it is only in rare cases that this can be given owing to the rapid onset of the insensibility. If, however, the patient can swallow, an emetic of mustard or salt and water, or any other emetic available, must be given. Stimulants must be given with the greatest freedom. If the patient can swallow, give brandy or sal volatile by the mouth, and inhalations of ammonia from a pocket handkerchief. If necessary the brandy may have to be given as an enema by the rectum. Alternate douches of hot and cold water must be applied to the head and chest. The antidote is atropine, which should be given hypodermically or as the tincture of belladonna in doses of half a teaspoonful. If necessary artificial respiration must be performed, and should be persisted in for a considerable time. As a rule all that the first-aid treatment can consist of is stimulation of the patient and artificial respiration till medical help arrives.

Hyoscyamus, Henbane.—Poisoning may occur through the plant being mistaken for parsnips, or through the seeds being used by mistake in cooking. Cases are on record where the tincture of hyoscyamus was taken in mistake for black draught. The symptoms consist of great excitement, with flushing at the face and a full, strong pulse. The patient loses the power of his legs and becomes giddy, the pupils are dilated, and the curious symptom of double vision is experienced. There may be sickness and vomiting. The speech becomes incoherent, and the mind is unbalanced. There may be actual delirium or even mania, which is, as a rule, followed by unconsciousness.

Treatment.—Empty the stomach by means of an emetic, and give brandy or sal volatile as stimulants. Rouse the patient in the state of unconsciousness by flicking with wet towels, by applying blisters to the calves of the legs, and by alternate douchings with hot and cold water. If the breathing becomes affected, perform artificial respiration. The antidote is pilocarpine, which should be given hypodermically, or as tincture of jaborardi, two tablespoonfuls of which should be given by the mouth or by the rectum.

Iodine.—Preparations of iodine are used externally, the chief being the tincture and the liniment. Poisoning may occur through their being taken internally. The symptoms are pain and heat in the mouth, throat, and stomach, with great thirst. There is vomiting, the contents of the stomach being coloured yellow or blue if there is any starchy food in the stomach. There is also severe purging, the motions being stained with blood. The patient becomes giddy, faint, and collapsed. There may be convulsions.

Treatment.—Empty the stomach by means of an emetic, and adopt the usual means of preventing collapse by stimulation. Give plenty of starch and water and demulcent drinks, as white of egg and milk, gruel, or arrowroot.

Laburnum.—All the parts of this tree are poisonous: many cases are recorded where children have chewed the bark or eaten the pods. The symptoms usually come on suddenly, but in some cases may be delayed for several hours. There is vomiting and purging, sometimes to a severe extent, giddiness and muscular weakness, and the skin becoming cold and clammy. The pupils are dilated, and the breathing may be seriously interfered with. Death may ensue from the collapse or from asphyxia.

Treatment.—The treatment is the same as in all cases where signs of poisoning come on after any berries or fruit has been eaten. Empty the stomach by means of an emetic, and follow this with a dose of castor oil. Apply stimulants, as brandy or sal volatile, and give alternate douches of hot and cold water to the head and chest. Hot fomentations should be applied to the abdomen and friction to the limbs. If necessary artificial respiration must be performed.

Lead, Sugar of Lead, Lead Acetate, White Lead, Diachylon.—Lead poisoning is much more common in the chronic form than in the acute: it is only with the latter, however, that we have to deal at present. Sugar of lead may be mistaken for alum in baking, white lead may be mistaken for chalk. Diachylon is largely used in some districts to procure abortion. It can only do this by producing dangerous lead poison, and fatal cases are on record from its use in this way. The symptoms of acute poisoning are a metallic taste in the mouth, with great thirst. There are severe colicky pains in the abdomen, the muscles of which are hard and rigid. Severe cramps with ultimate paralysis occur in the legs. The skin is cold, and there may be convulsions and delirium. Death may take place from collapse.

Treatment.—Give an emetic as usual. The antidote is sulphuric acid: this may be given as half a teaspoonful of the dilute acid. Failing this, Epsom salts or Glauber's salts should be given in half-ounce doses. Demulcent drinks, as milk or gruel, should be given, and poultices should be applied to the abdomen.

Morphia.—This is the typical narcotic poison, being one of the active constituents of opium. Poisoning may occur from an overdose or from some preparation being taken by mistake. The symptoms are peculiar. There may be an initial stage of mental excitement and increased physical power. This soon passes off, and is succeeded by a stage of depression. The mouth becomes dry, and great thirst is experienced. Severe headache ensues, and the limbs become heavy. The patient becomes dull, lethargic, and sleepy. Soon he falls into a deep sleep, from which he can with difficulty be aroused. The pupils of the eyes are contracted and look like pin-points; the skin is cold and clammy, and the patient is limp and flaccid. The pulse becomes weak and feeble, the respirations slow and laboured and almost imperceptible. Finally death ensues from failure both of the heart and the respiration.

Treatment.—Give an emetic. There may be great difficulty in encouraging vomiting in cases of morphia poisoning, but emetics should be persevered with. Give an ounce or two of Condy's fluid well diluted with water, and follow with another dose of the emetic. This process may be repeated several times. When the stage of depression appears, every effort must be made to prevent the patient falling asleep. This is best done by keeping him walking about and shouting at him. He should be flapped with a wet towel and have hot and cold water poured alternately over him. Sal volatile or ammonia should be poured on a handkerchief and given to him to inhale. If there are signs of failure of respiration, one or other method of artificial respiration must be employed. The antidote is atropine, which should be given hypodermically, or a teaspoonful of tincture of belladonna may be given by the mouth.

Mushrooms.—There are many varieties of poisonous fungi which may be mistaken for the ordinary harmless mushroom with disastrous results. As the harmless and the noxious varieties are not easy to distinguish, it is always wiser to err on the safe side and run no risks, keeping only to the variety known to be safe. When poisonous fungi have been taken, the symptoms are usually severe pain in the abdomen, with vomiting and purging. The face becomes pale and drawn, the pupils of the eyes are dilated, the skin cold and clammy, and the breathing rapid and irregular. There may be the most intense cold. The patient suffers from severe collapse.

Treatment.—Give an emetic, and follow with a dose of castor oil to which twenty drops of chlorodyne have been added. Keep the patient in the recumbent position and give stimulants—brandy or sal volatile. Apply hot fomentations or poultices to the abdomen, and friction to the legs and arms. The antidote is tincture of belladonna. Give half a teaspoonful in water, and repeat this dose in half an hour if necessary.

Nitrate of Silver, Lunar Caustic.—This is used as an external application or to the mucous surfaces of the lips and tongue. It may be swallowed by mistake, or lumps of caustic may be chewed. The symptoms of poisoning are principally vomiting, the vomited matter turning black on being exposed to the light. The throat and stomach are irritated and painful.

Treatment.—Give an emetic, and large quantities of common salt dissolved in water. Demulcent drinks—milk, gruel, or white of egg—should also be given.

Nitre, Saltpetre, Potassium Nitrate.—This may be taken accidentally in mistake for Epsom salts. The symptoms of poisoning are pain in the abdomen with vomiting and purging. The skin becomes cold, the limbs shaky, and later paralysed. There may be great collapse, and finally convulsions.

Treatment.—Give an emetic—mustard or salt and water—and demulcent drinks, as milk, white of egg, oil, or gruel. If there is much collapse, as indicated by the weakened pulse, give stimulants—brandy or sal volatile. Keep the patient warm by means of hot fomentations, hot blankets, or hot-water bottles. Rub the limbs, and keep him in the recumbent position.

Nitric Acid, Aqua Fortis.—Not only is the acid itself a powerful poison, but also the fumes from the concentrated acid. The symptoms are those of a corrosive poison. They usually come on immediately. There is intense burning pain in the mouth, throat, and gullet, with severe vomiting. The lips are usually stained a yellow or brown colour. The vomited matter is stained with blood and has a yellowish appearance. Owing to the corrosive action of the acid the soft parts of the mouth and throat are much injured, so that speaking and swallowing are painful. The pulse is weak and irregular, the skin is cold and clammy, and the breathing is embarrassed.

Treatment.—Remember, in corrosive poisoning never give an emetic. Give large quantities of soap and water, washing soda. Ammonia, magnesia, or lime-water should be given in large amounts. These alkaline substances are the antidotes to the acid. Any kind of demulcent drinks must be given to soothe the tissues, as oil, milk, white of egg, or gruel. Apply fomentations to the stomach, and guard against shock by keeping the patient warm.

Nitroglycerine.—This substance is used medicinally for certain diseases. It may be taken in mistake for beer. It causes severe headache, with throbbing pains and a feeling of pulsation all over the body. The face becomes flushed, and there is much depression. The patient becomes collapsed and may vomit. Death may come on rapidly.

Treatment.—Give an emetic, and adopt the usual precautions against collapse. Keep the patient lying down. Apply cloths soaked in cold water, with vinegar or eau-de-Cologne sprinkled on, to the head. The antidote is ergot. Give a teaspoonful of the liquid extract of ergot by the mouth, and repeat the dose in half an hour.

Nutmeg.—This is sometimes used as a remedy for diarrhœa, and is an old-fashioned and futile preparation to procure abortion. Children occasionally exhibit symptoms of poisoning through partaking of whole nutmegs. The patient becomes giddy and experiences great thirst. The chest feels as though it were constricted, and there is great difficulty in breathing. There may be vomiting, but only in exceptional cases is there any purging. The patient becomes delirious, and finally unconscious.

Treatment.—Empty the stomach by means of an emetic, and give a dose of castor oil or other purgative. Stimulants should also be given, strong coffee or spirits.

Nux Vomica, Rat's-Bane.—This substance is used in medicine, the chief active principle being strychnine. The powder is used as a vermin-killer, and may be taken by mistake or by design, as also may the seeds. The symptoms and treatment are the same as will be described under Strychnine.

Opium.—This substance is one very widely used in medicine. The chief active principle is morphia, which is derived from opium. This is itself derived from poppies, and symptoms of poisoning may follow on the eating of the leaves or seeds of these plants. The symptoms of opium poisoning are the same as already described under Morphia: they are typically those of a strong narcotic poison. The treatment is also the same. An important point to bear in mind in this connection is the fact that children bear opium very badly, a very small dose being sufficient to cause serious symptoms in a young child. Also, in the case of a person found unconscious, opium poisoning must always be considered as one of the possible causes. It must be distinguished from the unconsciousness produced by totally different causes—alcohol, apoplexy, concussion, uræmia, and the like. The differential diagnosis of all these has been discussed in the section on Insensibility, to which reference should be made. The great distinguishing feature about opium poisoning is the very small size of the pupils of the eyes.

Oxalic Acid.—This may be mistaken for magnesium sulphate, Epsom salts, or for sulphate of zinc. It is widely used for cleaning purposes, and may be found in most households. It also has a groundless reputation as an agent for procuring abortion: cases of poisoning are recorded from its use for this purpose. The symptoms vary. In certain cases there may be prompt collapse, and death may follow with startling suddenness. Usually, however, there are premonitory signs and symptoms. There is a burning pain in the throat, gullet, and stomach, with vomiting of dark-coloured matter stained with blood. There is also considerable purging. The patient becomes collapsed, the pulse is small and weak, and convulsions may usher in the end.

Treatment.—Alkalies should be given at once. Chalk and lime are the most convenient. Lime from the walls of a room may be used with success failing any other source of supply. This should be followed up by a dose of castor oil or other purgative. The usual precautions against collapse should be adopted.

Paraffin Oil, Petroleum.—This may be taken in mistake for something else, or deliberately in a fit of anger. There are many preparations of paraffin, any of which may cause symptoms of poisoning in like manner. There is an intense burning pain in the throat, gullet, and stomach, with great thirst and often vomiting. The breath smells strongly of paraffin. The face becomes pale and drawn, the skin is cold and clammy, the pulse is weak, and the respirations feeble. The vomited matters have some of the paraffin mixed with them, appearing as grease-spots.

Treatment.—Give an emetic and demulcent drinks as before. There is no special antidote: efforts must be made to keep the patient warm, and stimulants should be freely given.

Paraldehyde.—This substance is used as a sedative and hypnotic. Cases of poisoning occur from the taking of too large a dose or from the repeated taking of smaller doses. The symptoms consist of deep sleep, going on to unconsciousness, with contracted pupils and rapid collapse. The diagnosis is easily made from the peculiar smell of the paraldehyde in the breath.

Treatment.—As in any narcotic poison. Give an emetic, and prevent the patient falling into the deep sleep by making him walk about and by rousing him by every means which can be thought of. In cases of respiratory failure perform artificial respiration.

Phenacetin.—This powder is much used for headaches and neuralgic pains. An overdose causes increased headache, with vomiting and diarrhœa and increasing difficulty in breathing.

Treatment.—Give an emetic, and follow with a dose of castor oil. Keep the patient in the recumbent position, and apply warmth to the body and limbs. Stimulants should be given, and, if necessary, artificial respiration performed.

Phosphorus.—This substance is of special importance owing to its use in the preparation of matches, which are to be found in every household and may be sucked by children. It is also a constituent of many rat pastes. It is found in two forms, red phosphorus and white. The latter is the poisonous preparation, the former being harmless. Chronic phosphorus poisoning is found in cases of those employed in the manufacture of matches. The symptoms of acute poisoning consist in the taste of garlic in the mouth, pain in the throat and stomach, with vomiting. The vomited matters should be examined in a dark place, when the phosphorus will be seen to glow—an aid to the diagnosis. The pulse becomes weak and rapid, and there may be bleedings at the nose and gums. The patient becomes collapsed and delirious, and may be unconscious.

Treatment.—Empty the stomach by means of an emetic, and give mucilaginous drinks. The antidote is sulphate of copper, five grains of which should be given repeatedly in water. A dilute solution of potassium permanganate or Condy's fluid should be given. Follow this with a dose of castor oil, Epsom salts, or other purgative. Do not give oily or fatty substances, as the phosphorus, being more soluble in them, is the more readily absorbed.

Potassium Permanganate, Condy's Fluid.—This substance is largely used as a disinfectant and as a staining agent, and may be taken internally by mistake. The lips, tongue, and mouth are stained a dark brown, and are very painful. There is great pain in the stomach, with sickness and vomiting. The pulse becomes weak and the heart fails rapidly, leading to death from heart failure.

Treatment.—Give an emetic, and follow with a dose of castor oil or other purgative. Keep the patient in the recumbent position, and apply warmth by means of hot blankets, fomentations, and hot-water bottles. Give stimulants to prevent the threatened heart failure.

Strychnine.—This is the active principle of nux vomica. It is largely used in medicine, and is a constituent of many rat pastes. The symptoms of strychnine poisoning are typical. They resemble those found in cases of tetanus, but are distributed all over the body. The body is thrown into spasms, all the muscles being contracted. These convulsions come on one after the other, and may finally become continuous. The muscles of the neck are so contracted that the head is drawn powerfully back, those of the trunk and legs to such an extent that the back is arched and the patient rests on the back of his head and on his heels, with the body rigid in a stiff curve. In some cases the body may be bent forwards instead of backwards, or even to one or other side. The pupils are widely dilated, and the eyeballs stand out prominently. The pulse becomes weak and rapid, and the breathing much embarrassed owing to the contraction of the muscles of the chest. There may be cries at intervals, owing to the same contraction of the chest muscles forcing the air in the chest through the larynx. Death may arise from asphyxia during a convulsion, or may be due to collapse.

Treatment.—Give an emetic if the patient can swallow. This should be followed by giving large quantities of charcoal or wood cinders. Tannic acid may also be given, or tincture of iodine. Strong black tea will answer if nothing else can be obtained. Chloroform should be poured on a handkerchief or towel and placed over the patient's mouth and nose to overcome the spasm. If it is at all possible, perform artificial respiration. The antidote is bromide of potassium. Half an ounce of this may be given in water by the mouth or injected into the rectum. This should be repeated every quarter of an hour so long as the convulsions continue. Death by bromide poisoning is a much less distressing and less painful thing than by strychnine. Do not be afraid to administer bromides in abundance.

Sulphonal.—This is a purely hypnotic substance, and is similar to trional and tetronal in its action and results. It acts slowly, and is slow to be excreted from the body. Acute poisoning may arise through the taking of a single excessive dose: a form of chronic poisoning is caused by the repeated taking of smaller doses. The acute symptoms consist of giddiness, headache, and disturbance of the mental functions. The muscles of the legs become weak and uncontrolled in their action, so that walking or even standing is a matter of difficulty. The patient has the appearance of being drunk, goes off into a deep sleep, and becomes insensible. There is profuse sweating, but no urine is excreted. Death may come on quite suddenly after some time.

Treatment.—Give an emetic, and follow by a dose of castor oil or Epsom salts. Stimulants should also be given, and the patient roused as much as possible. Guard against collapse, as already shown.

Sulphuric Acid, Vitriol.—This may be taken by mistake, and is frequently used for suicidal purposes. The symptoms are those of corrosive poisoning. There is a burning pain from the mouth to the stomach; the lips and tongue are dry and parched, and are stained white in colour. There is severe vomiting, the vomited matters being dark and stained with blood. The pain is very acute, the skin is pale and cold, and perspiration is profuse. There is much collapse and ultimately unconsciousness, passing on to death.

Treatment.—No emetic, as it is a corrosive poison. Large drinks of soap and water, or chalk or lime and water, should be given. Magnesia, baking or washing soda should be given well diluted with water. Demulcent drinks should also be given—milk, white of egg, gruel, &c. Hot poultices should be applied to the abdomen to relieve the pain, and the patient kept warm by every available means. Stimulants should be given when there is any sign of collapse or heart failure.

Tartaric Acid.—This is found in all households, and may be taken in mistake for salts. It causes great pain in the stomach, with vomiting. Convulsions may be succeeded by collapse and unconsciousness, which goes on to a fatal issue.

Treatment.—Chalk or lime and water should be freely given, and a dose of castor oil to clear out the poison. Apply hot poultices to the abdomen, and adopt the usual measures to combat collapse.

Tobacco, Nicotine.—Tobacco poisoning may arise from chewing or from an overdose being given as an emetic. The symptoms are an intensification of those experienced from smoking too strong tobacco. There is great nausea and feeling of sickness, with vomiting. The skin becomes cold and clammy and covered with cold perspiration. The eyes become affected: the vision is blurred. The pupils are contracted at first, and later are dilated. The pulse becomes weak, and there is faintness and collapse.

Treatment.—Give an emetic, and then a dose of castor oil. Strong tea or tannic acid should be given frequently. Nicotine has a paralysing effect on the heart, which must be stimulated. Strychnine should be given hypodermically, or half a tablespoonful of tincture of nux vomica by the mouth. Brandy or sal volatile should also be given. The patient must be kept in the recumbent position, and warmth should be applied, as well as friction to the extremities. Be careful to keep the patient lying down for a considerable time, even after recovery is apparent, as any strain on the heart may have disastrous results.

Turpentine.—This is occasionally given in too large doses to expel worms, or may be taken by mistake. There is a strong odour of turpentine in the breath, and any urine that is passed may smell of violets. The patient becomes giddy, the pupils are contracted, the breathing is embarrassed and noisy. There may be collapse and convulsions. In some cases great pain is experienced.

Treatment.—Give an emetic—mustard or salt and water—and a purgative of castor oil or Epsom salts. Demulcent drinks—milk, white of egg, &c.—should be given, and, if there is much pain, hot poultices or fomentations to the abdomen.

Veronal.—The use of this hypnotic drug has much increased of recent years. It is much more dangerous than sulphonal or trional, and unfortunate results have occurred from taking too large doses. It causes sound sleep, which soon passes into unconsciousness, with a weak pulse and great difficulty in breathing. There is intense thirst. The skin of the arms and legs becomes very irritable and itchy, and there may be a red rash all over the body. The unconsciousness may go on to death.

Treatment.—Give an emetic and a purge. Stimulants should be freely given, strychnine hypodermically, or tincture of nux vomica by the mouth. The patient should be roused as much as possible.

Zinc.—The commonest salt of zinc which may cause poisoning is the chloride. It is the active principle in Burnett's disinfecting fluid, which may be taken in error. The symptoms are those of corrosive poisoning. There is pain and burning in the mouth, throat, and gullet, with vomiting of blood-stained matter. The pupils are dilated, the pulse is weak and rapid; the respiration is shallow and hurried, and there may be convulsions, with paralysis of the muscles. Death may be rapid, or may ensue on the unconsciousness which follows the collapse.

Treatment.—No emetic can be given. Ordinary baking or washing soda well diluted with water should be given, and demulcent drinks, as milk or white of eggs. Strong tea or tannic acid should be given as an antidote. Hot poultices or fomentations should be applied to the abdomen to relieve the pain. The patient is to be kept in the recumbent position and as warm as possible. Stimulants—brandy or sal volatile—should be given.

A LIST OF THE CHIEF POISONS AND THEIR ANTIDOTES

Acids—	
Acetic, Hydrochloric, Nitric, Sulphuric	Magnesia, chalk, lime-water. No emetics.
Carbolic	Epsom salts.
Oxalic	Magnesia, chalk, lime-water.
Prussic	Emetics. Atropine, tincture of belladonna.
Aconite	Emetics. Atropine, tincture of belladonna.
Alcohol	Emetics. Coffee.
Alkalies—	
Ammonia, Lime, Potash, Soda	No emetics. Vinegar, orange or lemon juice, tartaric acid, citric acid.
Antifebrin	Emetics. Brandy.
Antimony	Emetics.
Tartar emetic	Tannic or gallic acid.
Antipyrin	Emetics. Brandy.
Arsenic	Emetics. Soapy water, dialysed iron.
Asperin	Emetics. Brandy.
Atropine	Emetics.
Belladonna	Pilocarpine, tincture of jaborardi.
Caffeine	Emetics. Brandy.
Camphor	Emetics. No oils. Brandy.
Cantharides	Emetics. Laudanum.
Chloral	Emetics. Brandy, strychnine, tincture of nux vomica.
Cocaine	Emetics. Brandy.
Copper	Emetics. Milk, barley water.
Corrosive sublimate	No emetic. White of egg, brandy.
Digitalis	Emetics. Tannic or gallic acid.
Ergot	Emetics. Strong tea, tannic or gallic acid.
Iodine	Emetics. Starch and water.
Lead	Emetics. Sulphuric acid, magnesium sulphate, sodium sulphate.
Morphia	Emetics. Potassium permanganate, rousing, atropine, tincture of belladonna.
Nux vomica	Emetics. Charcoal, tannic acid, potassium bromide.
Opium	Emetics. Permanganate of potassium, atropine, rousing.
Phosphorus	Emetics. Epsom salts, sulphate of copper.
Strychnine	Emetics. Charcoal, tannic acid, bromide of potassium, chloroform.
Tobacco	Emetics. Tannic acid, strychnine.
Turpentine	Emetics. Magnesium sulphate.
Veronal	Emetics. Coffee, strychnine, rousing.
Zinc	No emetics. Soda bicarbonate.

J. S. P. Dickey, M.B.

HOME NURSING

INTRODUCTION

The following article is intended for those who wish to nurse their sick relatives and friends in their own homes. It gives a general outline of sick-room methods, and explains as simply as possible the easiest and best way of applying certain remedies, and of nursing particular diseases.

The information given will not qualify the home-nurse to undertake the nursing of acute cases without skilled help, but it will perhaps enable her to co-operate more effectually with a fully trained nurse and with the doctor.

THE INVALID'S ROOM

An invalid's room should be as large and sunny as possible, facing either south or south-east.

Sunshine has a wonderful effect on the nervous system, and to be able to see from his window the dawn of a new day will often bring hope and courage to a patient after a weary night.

A large window area is desirable, with dark curtains or blinds to exclude the light when necessary, but if the patient's condition permits, it is well to let the sunshine into the room, as it purifies and acts as a powerful disinfectant.

The room should be within easy reach of a hot and cold water supply and in the quietest part of the house, where the invalid will not be disturbed by the noises of the road or by the passing to and fro of the inmates of the house.

It may be necessary, in the case of a long illness, to convert a sitting-room into the sick-room. So much depends on the patient's surroundings that the choice of a room, its position in the house, and all arrangements made for the patient's comfort and happiness will repay any amount of trouble.

Ventilation.—The atmosphere of the sick-room is of primary importance, fresh air being as necessary as food. Impure air must be got rid of, and a fresh supply of pure air constantly admitted. At the same time draughts must be avoided. The windows should be always opened from the top, and in warm, sunny weather they may be opened from below as well. There are cases where even in cold, wintry weather it is better for the patient to have the windows wide open night and day, but the patient's condition and the nature of the disease must be taken into consideration.

It is never sufficient to air the room by opening the windows once or twice a day and keeping them shut between. Fresh air must be continually coming in and taking the place of the vitiated air.

A light, portable screen covered with washing material, placed between the door and bed, will be a great protection to the patient, and will help to ventilate the room by distributing the current of air, which tends to move in a direct line between the door and chimney. In very exceptional cases, where it is impossible to have the window open all the time, the patient should be well covered up in bed with a light wrap over the head as well, while the windows and doors are set wide open for several minutes; this may be done several times a day and once in the night or early morning.

The best and most hygienic way of warming a sick-room is by an ordinary coal fire. A fire is one of the chief factors in causing free movement of the air, so that it is advisable to have a small fire burning in the grate always, even in the summer time, and only when it is oppressively hot should it be dispensed with. A thermometer should be placed near the patient's bed, and the room kept at the same even temperature all the time.

As a rule the temperature of the sick-room should be about 60° Fahrenheit or higher; but a good deal depends on the nature of the case.

It is important to look at the thermometer at regular intervals during the day and night.

In cases of severe illness the patient's vitality is usually very low between 1 A.M. and 4 A.M., so that collapse must be guarded against by keeping up the temperature of the room, refilling hot-water bottles, and giving a warm, stimulating drink such as tea, coffee and milk, or bovril. Any other stimulant should be given only by the doctor's orders.

A pure current of air must be allowed to have free access by the window; in large towns the night air is often purer than the day, and the patient must not be deprived of its beneficial effects.

Choice of Bed and Bed-clothing.—A long, single, iron bed is the best for a patient. A double bed is heavy to move and difficult to arrange, although it has one advantage in giving the patient a cool, fresh side to be lifted on to, which might often be a great comfort.

The spring mattress and chain beds now in use are better in every way than the old-fashioned spring mattress. A good hair mattress is better than a flock, although a good flock is quite comfortable and suitable.

A single blanket, large enough to tuck in at the top, should be placed over the mattress, and the under sheet should be large enough to tuck in all round. Bolsters are not often used now; most people prefer single pillows. These should be arranged as the patient likes; usually a firm one underneath, and a nice soft one for the head.

There should always be a good supply of pillows, as often a change of position by rearranging the pillows and by putting a cool, fresh one to the head will be a refreshment, and may even induce sleep.

In nursing helpless patients and children it will be necessary to have a mackintosh on the bed to protect the mattress. This should be long enough to stretch across the bed and tuck in at the sides, and should be placed over the under sheet with a draw-sheet to cover it. Old sheets can be used as draw-sheets folded down the middle and stretched across the bed with the folded edge next the top of the bed. The surplus length of sheet should be rolled into a neat roll and tucked under one side of the mattress.

The blankets should be of English make, light, warm, and all wool; and they should be large enough to tuck in at either side.

A pretty light cover should complete the bed-clothing.

Position of the Bed and Furniture of the Room.—When the bed is a light, narrow one wonderful variety can be given to the patient by changing its position in the room; but during the acute stages of the illness, the bed must be placed so as to ensure quiet and comfort for the patient. It should not be placed against the wall, the nursing being so much easier if the patient can be reached from either side of the bed; it may be placed facing the window and its side to the door, or the side to the window with a screen between it and the door. But avoid having it inside the triangle formed by lines joining the door, window, and fireplace.

All heavy curtains and drapery should be avoided, and rugs which can be taken up and shaken are preferable to carpets. At the same time the room must never be rendered more bare and comfortless than the needs of the case demand.

If there is a dressing-room adjoining the sick-room, all the invalid requisites may be kept there. But if not, the washstand and table with medicines, dressings, &c., must be conveniently placed, yet so that neither the patient or any visitor coming into the room will be aware of their existence.

Basket or wicker chairs should not be used, as the constant creaking sound is very objectionable. There should be three or four light easy chairs, a comfortable couch, a chest of drawers for the patient's things, and one or two tables. The wall-paper or colouring should be rather light (green is perhaps the most universally soothing colour), and red should be avoided. The curtains and furniture should be in harmony with the walls and woodwork of the room.

A few good pictures will be of great help in providing the patient with interest. During a long illness the pictures might be changed from time to time to make a variety.

Flowers will almost always give much pleasure, as well as adding greatly to the beauty of the room. They should never be allowed to remain in the room when they have begun to fade, and all strongly-scented flowers should be avoided, or only allowed to remain in the room for a short time. Flowers and plants should all be taken out of the room at night.

The Care of the Room.—If the room has no carpet, only rugs as suggested, they should be taken up and shaken daily, and the floor rubbed over with a floorcloth and the woodwork carefully dusted. This should be done, if possible, after the patient's bed has been made and the toilet completed. The fire could be done quite early. All noisy fire-irons should be dispensed with, and the coal lifted on with a piece of paper or by using a glove. A piece of stick to stir the fire makes the best and quietest poker. Then the room should be quickly and quietly dusted, quickly because quick, methodical dusting is much more effective and less likely to worry the patient than slow, aimless rubbing.

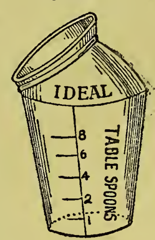
After the dusting the flowers and pictures should be arranged so that the room is in perfect order and the patient quite ready for the doctor's first visit. The arrangement of the room should be a matter of great care and thought. If the patient expresses any ideas about it they should, as far as possible, be carried out.

Often much annoyance may be avoided by planning the early morning hours so as to get everything in order before the doctor comes.

The sick-room, therefore, should not only be bright and comfortable in appearance, but it should be a place where time, law, and order are strictly adhered to.

INVALID REQUISITES

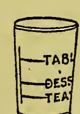
Feeding-cup.—If the patient is helpless and obliged to lie flat on his back a feeding-cup will be necessary. The old-fashioned cup with a spout like a teapot has been condemned because of the difficulty of keeping the inside of the spout absolutely clean. The "Ideal" is the best one without a spout, and may be had both in china and glass. It is well to have one of each, a china one for tea, coffee, or soup, and a glass one for milk, lemonade, or soda-water



"Ideal" Feeding-cup.

Clinical Thermometer.—A good clinical thermometer should be kept in every family medicine cupboard. A half-minute English make is the best, and it should be kept in a nickel case. Always disinfect carefully in carbolic lotion, 1 in 40, both before and after use.

Medicine-glass.—Medicines should always be measured in a measure-glass and drops in a minim measure. A larger measure is used for lotions, and an earthenware jug-shaped measure is useful for measuring milk or other fluid drinks.


Measure-glass.

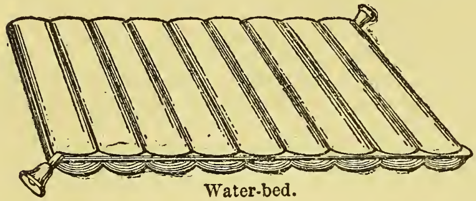

Minim Measure.

Mackintoshes.—Mackintosh for beds should be waterproof on both sides. It may be bought either by the yard or in sheets large enough to cover a whole mattress.

All mackintoshes should be scrubbed once a week. In order to do this thoroughly, lay the mackintosh out on a table and with a brush and soft soap and water scrub first one side, then the other. Remove the soap with a flannel and plain warm water, and hang up to dry.

Any stains on the mackintosh can be removed with a little Sapolia or Brooks' soap. If it is an infectious case the mackintoshes should be washed over with 1 in 20 carbolic lotion.

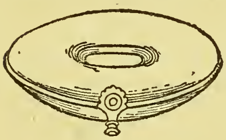
Water-beds.—These may be had in several sizes, and are very useful in cases of paralysis or where the patient is very thin. The most useful size is



Water-bed.

36 by 24 inches. The probable cost would be £2, 2*s.*, but they can be hired from almost any surgical supply store from 3 to 5 shillings a week.

Air-cushions.—These may be had in almost any variety of shape and size, and are often a great comfort to the patient. Perhaps the most useful is the circular air-cushion; this is filled with as much or little air as will make it comfortable under the patient's back. When not in use an air-cushion should never be emptied and folded up, but a little air should be left in and it should be laid away flat.



Air-cushion.

Bed-pans.—There are two kinds of bed-pan—the round one, which is most suitable for children, and the slipper. The "Neinecke Perfection" is perhaps the best, and is most easily cleaned.

Spittoons.—Cups for expectoration should be of china with a lid; but if the patient is up and able to get about a spitting flask will be more useful. Needless to say, these utensils must be kept scrupulously clean. About a teaspoonful of strong carbolic (1 in 10) should be kept in the cup and flask always. In the lavatory or near the sink where these articles are washed there should be a special brush for cleaning and towel for drying, and kept quite apart from any other towels or brushes which may be used.

Spittoon—China Cup with Lid.

There should always be two cups in use, so that when one is being cleaned the patient never has the discomfort of being left without one. The same applies to basins if the patient is sick. Put a clean one on the table near the bed when you remove the one that has been used.

To keep the invalid utensils clean and properly disinfected is a most important part of the nursing work, and ought not to be left entirely to servants.

Spitting Flask.

A jar should be kept in the lavatory with some strong-smelling disinfectant, such as carbolic or Sanitas. A small mop should be kept in this jar for cleaning the bed-pan after use; and a special towel with a loop on it should be hanging near and kept for wiping the bed-pan only. After scalding and drying the bed-pan put a very little disinfectant in it and keep it in a convenient but not conspicuous place in the sick-room, covered with a clean towel as well as the lid.

All excretions should be removed from the patient's room at once. A little cold water poured over the motion is better than anything for counteracting the smell.

Urine should be removed from the room, and not allowed to remain without a cover. During the night if it is impossible to empty it away at once it should be covered up. The gases which rise from it are of a poisonous nature, and vitiate the air much more than people think.

CARE OF THE INVALID

We hear of people being "born nurses," but this is not exactly the case. True, some have much more aptitude for nursing than others, but, as in all other professions, natural gifts must be cultivated.

For home-nursing the ideal mother or sister would be best qualified to undertake the care of the invalid—the one in the home to whom all naturally turn for the satisfaction of their most intimate personal needs, because she has an understanding mind, a delicate and ready tact, with a power of apprehending and supplying wants.

She will have the advantage of the professional nurse to begin with in being intimate with the character and temperament of her patient. Much unnecessary suffering may be avoided by this knowledge.

She will realise the necessity of considering the temperament of her patient and modifying the treatment accordingly.

In all cases guard against noise and fuss. Move about quietly and lightly. Lift things firmly but quietly, and put them down gently. Speak in a quiet voice, but never in a whisper, as that is very irritating to a patient. Do all that has to be done quickly and thoroughly. Be punctual with all meals, giving of medicine, and applying treatment. Be faithful in fulfilling every promise made to the patient, and regard all that passes in the sick-room as sacred, not to be repeated on any account, or talked over with others.

Always inspire the patient with confidence in his doctor. Never question his treatment or doubt the wisdom of his methods, but carry out faithfully all his instructions, and let the patient see and feel that both his nurse and doctor are working together for his good. This co-operation will inspire him with confidence, so that he will respond more readily to the prescribed treatment.

Observations.—Accuracy is one of the first absolutely necessary lessons to be learned by those in charge of the sick—accuracy in observation, in the description of what is observed, and in carrying out orders in every detail.

There are several details about a patient's condition which a careful nurse habitually notices and reports upon.

These are: the general appearance and condition—pale or flushed, listless or restless, or if there is a drawn, pained expression; the condition of the skin—moist and clammy, or hot and dry; the colour of the lips and appearance of the tongue; appetite; sleep—notice the character of the sleep as well as duration, if it be restless and uneasy, light and fitful, or dead, heavy sleep with loud breathing. All excretions should be carefully observed.

Notice also *urine*—the quantity and frequency, and if any discomfort or difficulty in passing it; *motions*—the frequency and appearance of the motions, if any hæmorrhage, whether it be dark-coloured and mixed with the motion or bright red in clots; *vomit*—if the patient is sick, notice what the vomited matter is like, and if there is blood, if it be bright red or dark in colour; *cough*—notice if the patient's cough is constant, deep or shallow, wheezy or hard and painful, if there is any expectoration, the character of it, if there is much pain and exhaustion; *position*—always observe the patient's position in bed, particularly when asleep. It is one of the best ways of learning how to make him most comfortable. Notice if he sleeps better on one side than on the other, if he coughs less on one side than the other, and if he is less sick; if in pain notice if he is relieved by change of position.

Effect of Remedies.—When the doctor has ordered a certain remedy he will expect the nurse to notice and report on its effect. For instance, if a sleeping draught has been ordered notice and report the exact amount of sleep, how long the draught took to take effect, and if the patient seemed refreshed after it, or woke up with a headache and feeling sick; or if a drug has been ordered to stop vomiting, notice if the intervals between the attacks of vomiting are lengthened and if the pain and discomfort is less.

Certain drugs have certain definite effects, and these must be noted with care. A notebook should be kept with the written report clearly and distinctly recorded, the night report on one page and the morning report on the opposite side. Rule the page into as many columns as are necessary, perhaps four or five, and record:

Sleep.—Amount and kind.

Food.—Quantity and kind, hours it was given.

Medicine, stimulants, &c.

Applications.—When changed and appearance of swelling or wound if any.

A chart with the temperature, pulse, and respiration records must be carefully kept.

Pulse.—To take a patient's pulse properly use a watch with a minute hand. Place the tips of three fingers over the radial artery at the wrist and count the number of beats to a minute. At the same time notice the quality of the pulse, if it be full and bounding, rapid and thin, or feeble and soft.

Respirations.—Count the respirations without the patient's knowledge by placing the arm across the body below the chest when taking the pulse rate. When you have taken the pulse keep your fingers on the wrist a little longer and count the rise and fall of the chest in respiration. Notice if the breathing is short and shallow, or deep and laboured. When there is any great difficulty in breathing, care must be taken to alter the patient's position. As a rule when breathing is difficult the patient is much more confortable sitting up. He should be well propped up by pillows or a bed-rest. In some cases it is not permissible to sit the patient up. When this is so, sometimes oxygen is ordered and affords great relief, and in all cases fresh air is absolutely necessary.

Temperature.—To take the patient's temperature use a good clinical thermometer, ranging from 94° to 110° Fahrenheit. The degrees are marked on the glass by long lines. In between these are four short lines dividing them into five points. The normal temperature, being 98·4°, is usually marked on the thermometer by an arrow or thick black line.

Before taking a temperature, shake the mercury down to its lowest point, and disinfect it by dipping it into a solution of carbolic or lysol before inserting it under the patient's tongue. See that the lips are closed over it and keep it in position for one, three, or five minutes according to the thermometer. The reading should be recorded on a chart which corresponds to the markings on the thermometer, and kept regularly twice a day or four-hourly as the doctor thinks best.

For children, old people, and unconscious patients it is best to take the temperature by placing the thermometer under the arm or in the groin. If under the arm, it should be kept in position by folding the arm across the chest. A child should never be left with a thermometer or be held responsible for it. Be careful to disinfect the thermometer before putting it back in its case.

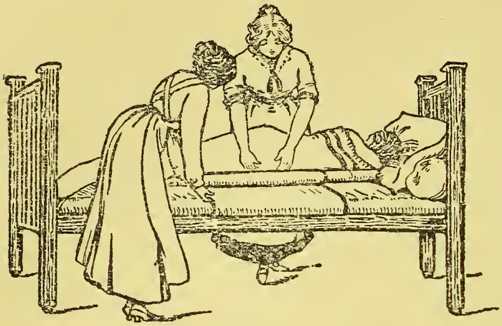
Note.—The temperature should never be taken after the patient has had a hot drink, and should be taken before he is washed. If cold or tepid sponging is ordered to bring down the temperature, it ought to be taken before and after the sponging.

MAKING THE BED

There is a great art in making and keeping a patient's bed healthy, comfortable, and tidy. The bed-clothes must be aired daily and the linen changed regularly. If the patient is quite confined to bed and likely to be ill some weeks or months, it is very necessary to have two sets of blankets and mackintoshes, one for day and one for night use. Otherwise it is impossible to get the blankets thoroughly aired. If the patient is able to get up or be moved on to a couch the making of the bed will be comparatively easy. The bed-clothes should be taken off one by one and hung over a chair, and the mattress turned from top to bottom every day. If a mackintosh is required it should be put over the under blanket or just under the draw-sheet if there is one.

When the patient is too ill or helpless to be taken out of bed and the under linen has to be changed it is necessary to make very careful preparations beforehand. It is much easier for the patient to have two people make the bed instead of one. It saves much unnecessary turning and passing from side to side. Have ready two clean sheets and a draw-sheet well aired and warm, a nightdress (there should always be two in use, one for the night and one for the day), warm water, soap, towels, and spirit and powder. If the patient is likely to feel cold a nice hot bottle should be put to his feet.

Remove the top cover, one blanket, and top sheet, leaving the patient with at least one blanket to cover him. Untuck the under bed-clothes all round and turn the patient gently over on to his side, roll the under-sheet, mackintosh, and draw-sheet close up to the patient's back, and place the clean under sheet, rolled to half its width, alongside, and the clean draw-sheet rolled to about half its length by its side. It will save much time and moving if there are two mackintoshes, one to



Putting on Draw-sheet.

replace the other, when the draw-sheet is changed, otherwise the mackintosh taken out will have to be washed over, dried, and put in again.

When the patient is on his side it is a good plan to take the opportunity of washing his back and hips, rubbing with spirit and powder. When this has been done draw the nightdress down very smoothly, and see that there are no wrinkles under him; then turn him right over on to his other side, remove the soiled sheets, and unroll the clean ones, tucking them smoothly and tightly under the mattress all round. Put the clean top sheet on over the blanket which is covering the patient and a blanket over it, so that when you draw the blanket which is covering him away he will not be left with only a sheet. Then finish making his bed as quickly as possible. Remove all soiled linen from the room, and never air sheets or towels in the sick-room.

In some cases a patient cannot be turned from side to side to have his bed made, then the under-sheet must be put in from the top of the bed. Roll the clean sheet along its width to within a yard of the top, untuck the soiled sheet all round, get someone to raise the patient's head and pillow while you roll down the soiled sheet under them, and tuck the clean sheet in at the top of the bed. Then the head may be laid down while the shoulders are raised and both sheets rolled down under them. Next the lower part of the body is raised, and the sheets passed under it, so that by degrees the soiled sheet can be removed and the clean one unrolled and tucked in all round. If the patient is not too ill he will probably be able to lift himself up so as to have the draw-sheet and mackintosh put in under him, but if he cannot do this the clean draw-sheet should be pinned with safety-pins to the soiled draw-sheet, and then the nurse should gently raise the lower part of the patient's body while your assistant pulls the draw-sheet through, leaving the clean one under the patient. Great care must be taken to see that the mackintosh and draw-sheet are kept quite smooth under the patient.

It is not enough to make the bed night and morning; but it must be attended to many times a day, and the invalid kept comfortable, sheets smoothed, and pillows rearranged whenever it seems necessary. An injured limb should always be supported on a pillow. If the patient has pain in the abdomen and keeps his knees drawn up, a long pillow, stretched across the bed under his knees, will be a great relief.

In some illnesses, such as rheumatism and nephritis, the patient will be ordered to be kept between blankets. In this case very soft, light, smooth blankets should be used. A large Yaegar shawl is better than anything as a covering in a case of rheumatism; it is so beautifully soft and warm and yet so light. Put a sheet on the top of the shawl or blanket which covers the patient, and make it come higher up, so that the woollen blanket does not come against the patient's face.

The blankets should never be doubled over on the patient's chest; they should come well up to his neck, and the extra length tucked in at the foot of the bed.

When the invalid is well enough to sit up and have his bed made, a comfortable chair should be placed near the bed, and a blanket spread out over it. He should have warm stockings and slippers on, and a blanket or large shawl wrapped round him as he gets out of bed. When he sits down the blanket on the chair should envelop him all round. In cold weather a hot bottle should be placed at his feet, and a screen put round the chair to protect his head and shoulders from any draught.

In long illnesses, when the patient becomes very thin, it may be necessary to have a water-bed or cushion. One about 20 by 30 inches is a useful size. It should be rolled in under the patient the same way as a draw-sheet, and filled after it is in by means of a funnel. Warm water from 80° to 90° F. should be used, and it should be filled with just sufficient water to prevent any part of the body pressing on the under side of the cushion. If it is filled too full it becomes hard and uncomfortable. The draw-sheet should come over the water-cushion. If a full-sized water-bed is used boards should be placed across the bedstead, under the mattress, to support its weight and keep it level.

The Toilet.—As a rule it is advisable to give the daily bath at night; but if the fatigue of having the whole body sponged at one time is more than the patient is able to bear, then the upper part may be washed in the morning and the lower part in the evening. Before commencing to bath the patient see that the room is warm, and have hot bottles in the bed. Have a night-dress and towels warming by the fire, a jug of hot water and a jug of cold, sponge, flannel or bath-glove, soap and toilet vinegar, powder and spirit.

Remove the top sheet and all the blankets but one. Put a towel round the patient's neck, and wash and dry the face and ears first; then slip a large bath-towel over the patient under the blanket and remove the night-dress; wash the neck, hands, and arms and dry them with another towel. The chest and lower part of the body must then be washed under cover and dried carefully. To wash the lower limbs put a large towel or bath-blanket underneath them to prevent wetting the bed-clothes. As the feet are particularly sensitive to the touch it is best to put them one at a time into the basin to wash them. Dry carefully but with a firm touch, as it is less likely to irritate.

After washing the lower limbs, turn the patient on to his side and place a bath-towel alongside of his back. Wash the back of the neck and shoulders and dry, then the spine and hips. Rub all prominent parts, such as shoulder-blades, spine, lower part of the back and hips with methylated spirits or eau de cologne. This will harden the skin and prevent bed-sores. Powder with some fine soft powder such as white fuller's earth or talc powder. The washing over, put on the night-dress, and quickly replace the top sheet, blankets, and cover.

In cases of acute rheumatism, nephritis, or pneumonia, long loose flannel jackets, fastening down the back, with wide sleeves tied with tape at the wrists, will be found much more convenient than the ordinary night-dress.

After the bath remove all the wet towels to another room to be dried, and when they are dry they should be brought back to the patient's room, folded neatly, and hung on the towel rail. Attention to small details of this kind will add much to the patient's comfort.

Care of the Teeth.—The teeth should be well brushed twice a day and the mouth washed out with a little carbonate of soda in warm water after each meal. Unless the patient is very ill or helpless he will always prefer to brush his own teeth, but if he is too ill to do it for himself it must be done for him with a soft toothbrush and good dentifrice. The patient's mouth frequently gets into a bad furred or coated condition, and must be cleaned several times a day. To do this thoroughly put a little glycerine and lemon-juice into a cup or porringer, take a thin strip of white absorbent wool and twist it round a toothbrush handle, dip it in the glycerine and swab the gums, tongue, and roof of the mouth, renewing the strips of wool from time to time and placing the soiled pieces on a dressing-tray or saucer to be burned afterwards.

Nails.—Finger and toe nails should be kept scrupulously clean and trimmed regularly. For cleansing them soap and water and good nail-brush are the best things to use. The finger nails may be polished after washing with chamois leather.

Hair.—The care of the hair is an important part of the patient's toilet. It should be brushed night and morning. A woman's hair should be parted down the middle and dressed in two plaits, one on either side. The scalp may be rubbed occasionally with a little rosemary to keep it clean; but so long as the patient is very ill the brushing and combing will probably be all that can be done. When convalescence is well advanced the hair should be washed in this manner. Prepare a shampoo powder in a jug of warm water, get the patient to lie pretty low down in the bed—to allow room for a basin to be put between the pillow and top of the bed—spread a mackintosh and towel over the pillow and under the basin and another towel round the patient's neck, put the hair into the basin and pour the shampoo mixture over it, rubbing it well into the scalp. Rinse well in warm water, emptying the basin from time to time, and dry with hot towels. A little spirit or bay rum will help it to dry more quickly.

To Prevent Bed-sores.—Any part of the body where there is any pressure is liable to become tender and sore. The most usual place for a bed-sore is the lower part of the back; but the careful nurse will guard against even the possibility of redness by using means to prevent it. All prominent parts, such as the spine, shoulder-blades, hips, heels, elbows, &c., should be washed night and morning with a good lather of plain unscented soap, dried with a soft towel, and rubbed with methylated spirits, eau de cologne, or brandy (for a very dry skin brandy with olive oil is the best thing). The chief point is the rubbing, as it is when the vitality is low and the circulation poor that the bed-sores occur. Therefore rubbing promotes circulation, and is the best preventive. After rubbing dust well with some fine powder, starch, and zinc, white fuller's earth, or talc.

But in spite of every precaution bed-sores may occur. They should always be regarded as an unfavourable sign, and be reported to the doctor at once.

Some doctors prefer to give directions for treating bed-sores themselves; but if not various dressings may be used.

First of all the wound must be kept absolutely clean by bathing it with warm boracic lotion and changing the dressing at least twice a day.

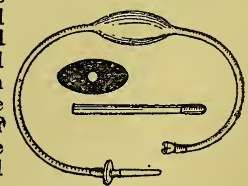
Spread a piece of lint with the ointment you intend to use. Ichthyol, boracic, and hazeline are all good. The lint should be spread on the smooth side, and a piece large enough to last for a day or two might be spread at one time and kept in a small tin box.

For the dressing cut a piece of spread lint a very little larger than the sore, and after bathing the wound and cleaning carefully round the edges with a swab, apply the dressing, keeping it in its place with strips of adhesive strapping.

If the sore discharges a good deal, it should be fomented three or four times a day with boracic fomentations. The boracic lint should be cut about a quarter of an inch larger than the wound all round and covered with a piece of protective or oil silk a quarter of an inch larger than the fomentation, the dressing kept in place with adhesive strapping.

If this treatment is not successful other dressings may be tried, such as red-lotion, cyanide gauze, &c. *See* Treatment of Ulcers.

Enemata.—An evacuant enema is frequently ordered for constipation, and is usually given with a Higginson's syringe. This is a tube with a bulb in the middle which acts as a pump. At one end there is a small metal valve to prevent the fluid drawn into the tube from flowing back into the basin. At the other end there is a white bone nozzle which is passed into the rectum. The simplest enema is soap and water. Take a quart of hot water and mix into it about an ounce of soft soap. The temperature of the enema should be about 99° F.



Higginson's Syringe.

Put the syringe into the water and squeeze the bulb several times, allowing the fluid to flow through until there are no air bubbles; place the basin on a chair by the side of the bed. The patient should lie on the left side with the knees drawn up.

Place a folded towel under the pelvis, but keep the patient carefully covered up all the time. Find the anus with the middle finger of the left hand, and with the right hand take the nozzle, which should be well smeared with vaseline, and gently place it at this point. Be careful not to force it into the orifice when the muscle is contracted, but wait a minute until it relaxes, when it can be inserted quite easily and without pain or discomfort to the patient. If there is any difficulty with regard to retention, or if the patient is unable to lie on his side, then the enema must be given with him lying on his back with his knees drawn up and the bed-pan placed under him.

Give the injection slowly. If the patient complains of discomfort before sufficient fluid has been injected, stop for a minute or two without withdrawing the nozzle and then proceed.

After the enema has been given it should be retained for a few minutes. As it is a very unpleasant and exhausting treatment every care should be taken to bring about the desired result without having to repeat it. A simple soap and water enema may be made more efficacious by adding a few tablespoonfuls of olive oil to it. But in cases of severe constipation the best method is to give four or five ounces of warm oil first, turning the patient on to his right side to enable him to retain it. Then about an hour after give the soap and water.

Turpentine Enema.—Make rather more than a pint of thin gruel and add to it two tablespoonfuls of turpentine, mix carefully, and inject with a Higginson's syringe in the same way as a soap and water. It is ordered in cases of severe flatulence.

Salt Enema.—Two tablespoonfuls of salt to a pint of warm water. Usually given to children for thread-worm.

Castor Oil Enema.—Mix two tablespoonfuls of castor oil with one ounce of soft soap, beating them up together with a spoon or broad-bladed knife. Add to it slowly, stirring all the time, a pint of warm water. Give in the same way as a simple enema.

Starch and Opium Enema.—Make about a teacupful of hot-water starch fairly thick and add to it one teaspoonful of opium. This injection is given for hæmorrhage of the bowel or for diarrhœa, and is intended to be retained. It should not be above 98·4° F.

Glycerine Enema.—Pour about half an ounce of glycerine into a cup or small basin and stand it in a larger basin of hot water for a few minutes to warm it. Give with a special glycerine syringe, or ordinary glass syringe. Fill the syringe with glycerine and expel the air by holding the point uppermost and pushing the piston up until the glycerine reaches the point of the syringe, then inject in the usual way.

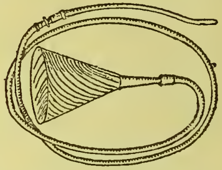
Glycerine suppositories are often used instead of enemas; they are cone-shaped, and when smeared with vaseline are easily inserted.

Nutrient Enemata.—In cases such as gastric ulcer, &c., where it is necessary for the stomach to have a complete rest, the patient may be fed by nutrient enemas. From four to eight ounces of food, if carefully prepared may be given in this way.

The food is usually composed of one and a half ounces of milk, one and a half ounces of strong beef tea or meat juice, the yolk of an egg beaten up, and half an ounce of brandy, if stimulant is ordered.

To peptonise this small amount take about a third of a Fairchild's peptonising powder, mix with a teaspoonful of warm water, and stir into the mixture before the stimulant has been added to it. Let it stand in a warm place or in a basin of warm water for ten minutes, stir it round, and add the stimulant. It should be between 98·6° and 90° when injected.

In feeding by the rectum a soft catheter and glass funnel will be found much better than the old-fashioned ball syringe. Before giving the nutrient it will be necessary to give a simple enema in order to wash out the lower bowel. Warm the catheter by running some warm water through it, smear well with vaseline, and gently insert into the bowel from five to six inches. Pinch the tube close to where it is inserted and allow all the air bubbles to escape. Pour the nutrient into the funnel and allow it to pass into the bowel drop by drop, taking care to refill the funnel and not let any air get into the tube.



Catheter and Glass Funnel.

As the patient is absolutely dependent on this very small quantity of food it is most important that it should be retained, so that any carelessness in administering it is almost unpardonable in a nurse. After each nutrient the patient must rest, and every unnecessary movement avoided. If there is any difficulty in retaining it, raise the patient's thighs on a pillow and press the hips together for a quarter of an hour. Sometimes five to ten drops of opium added to the nutrient just before injecting takes away the uneasy sensation and helps retention; but it would only be ordered if the doctor thought it necessary.

To avoid the irritation of the bowel caused by artificial feeding, a simple soap and water enema should be given every second day, and an injection of warm water on the alternate days. Usually a meat suppository is given alternately with a fluid nutrient; this should be smeared with vaseline before inserting into the bowel.

The patient should be fed in this way every four to six hours during the day, according to the quantity, and usually one nutrient and one suppository during the night.

Patients fed in this way suffer greatly from thirst, and the tongue and mouth become coated and dry. They should be allowed to wash out the mouth frequently with warm water and a pinch of carbonate of soda. Glycerine and borax, with a few drops of lemon juice applied with a very soft tooth-brush or swab of cotton-wool on the end of forceps, will help to cleanse the mouth and allay thirst.

ADMINISTERING MEDICINES

All medicines, aperients and stimulants, &c. should be carefully labelled and kept in a small cupboard or on a small table by themselves. Lotions and ointments should be kept on the lower shelf of the medicine cupboard, or on a separate tray.

For administering medicines have ready on a small tray a small bowl with cold water for washing the medicine glass, and a jug or bottle with a little fresh water for adding to the medicine if necessary, and a clean glass-towel to be kept for medicines only.

In giving medicines be very careful to carry out the doctor's instructions. If by chance a dose is forgotten or the patient asleep, never make it up by giving a double dose or by giving it more frequently during the day.

Read the directions on the label of the bottle each time the medicine is given, and shake very thoroughly, seeing that all the sediment at the bottom of the bottle is well mixed. Pour from the opposite side of the bottle to the label, so that any drop running down will not soil it.

Aperients are usually ordered to be given on an empty stomach, that is, before meals; tonics and acids to be given after meals. These instructions, when carefully attended to, aid in the efficacy of the remedy.

Medicines should be given in the least disagreeable form possible. Powders should be given in wafer papers. Place a wafer on a saucer, and pour over it sufficient cold water to moisten it. Place the powder in the centre of the wafer, and fold the edges of the wafer over it with the handle of a teaspoon. Give it to the patient in a teaspoon with a little water to drink after it, warning him not to bite it but to swallow it whole.

Castor oil, being very unpleasant to take, may be given in hot coffee. Pour a little hot coffee into a glass, then pour the oil into the centre of it, add a little more coffee to cover the oil. Hot lemon juice will serve the same purpose. Get the patient to hold his nose and to swallow it at one gulp; in this way he will scarcely notice anything disagreeable. To give a seidlitz powder, dissolve the contents of the blue packet in half a tumbler of water, and when the patient is quite ready to take it, add the contents of the white paper, stirring quickly with a teaspoon. It should be taken while effervescing.

Mineral waters and salts should all be taken in hot water and about an hour before breakfast.

In giving medicine to an unconscious patient open the lips with a spoon and give the medicine very slowly from a teaspoon, holding the teaspoon in the mouth until the medicine is swallowed. If the patient holds it in his mouth and won't swallow it, try holding the nose or pressing the throat gently under the chin.

All empty medicine bottles should be washed and put away. All liniments or external applications should be kept in dark green or blue bottles with red labels. Ointments should be kept in wide-necked bottles or jars with lids, which should be carefully wiped after use. All prescriptions used during an illness should be kept carefully tied together and dated, so that the doctor might have them to refer to at any time.

Stimulants should be given by the doctor's orders only, and diluted with water or soda-water according to directions.

Sleeping-draughts should be given when the house is quiet and the patient settled for the night.

DOMESTIC MEASURES

Drops should be measured in a special minim glass.

1 drachm	= 1 small teaspoon.
2 drachms	= 1 dessert spoon.
½ an ounce	= 1 table-spoon.
1 ounce	= 2 table-spoons.
4 to 5 ounces	= 1 small teacup.
7 to 8 ounces	= 1 breakfast cup.

POULTICES

The making of good poultices requires practice, neatness, and speed. They should be removed or renewed before they become cold. When they are no longer required the skin should be gently wiped with a soft towel, and anointed with cold cream or white vaseline if at all red, and covered with a piece of fine flannel or white absorbent wool.

Linseed Meal Poultice.—In preparation have ready some linseed meal, quite fresh, a kettle of boiling water, a small basin, spatula or broad-bladed knife, piece of flannel, or old linen or tow, some thin muslin or gauze, bandage, cotton wool, and safety pins. Heat the basin and blade of the knife by pouring boiling water into the basin, and dipping the knife in it. Pour away that water, and then pour in just enough water to make the poultice the size required.

Sprinkle in the meal through the fingers, stirring all the time, mix to a good consistency until the mixture comes clean away from the edges of the basin, and when well mixed turn out on to the piece of flannel or linen or tow. Pour some more boiling water into the basin, dip the blade of the knife in it, and spread the linseed smoothly over the flannel, cover it with a piece of muslin, and fold the edges of the flannel neatly all round.

Apply as hot as possible, covering with a good pad of cotton wool. When necessary keep in position with a bandage fastened with safety pins.

If the poultice has to be carried from one room to another put it between two hot plates to prevent it cooling.

Two or three tablespoonfuls of made mustard may be added to a linseed poultice just before turning it out on to the flannel.

Bread Poultice.—Put some broken pieces of bread into a small saucepan with sufficient water to cover them. Stir with a spoon until nearly all the water has evaporated, turn on to a piece of soft linen, and spread out smoothly.

Apply without anything between it and the affected part. A bread poultice is very cleansing and soothing, but does not retain the heat very long.

Charcoal Poultice.—May be made of bread or linseed according to directions, mixing into the meal or bread about a fifth part of finely powdered charcoal, and apply with nothing between it and the affected part.

Soda Poultice.—Instead of using plain boiling water for a linseed poultice use boiling soda and water, a handful of washing soda to one pint of water. This is a useful application for rheumatism.

Fomentations.—How to prepare fomentations is described on p. 583.

Belladonna and Glycerine Fomentations.—Spread three teaspoonfuls of belladonna and glycerine, which may be had in small quantities from any chemist, over a piece of lint the size of the affected part and apply it. Then put on an ordinary hot-water fomentation, keeping it in place with a bandage.

Mustard Plaster.—Make a smooth paste of mustard with a little flour added to it. Spread on a piece of brown paper the size required, leaving a margin all round. Cover with a piece of fine muslin and fold down the edges neatly. Apply and keep on from ten to thirty minutes, or as long as the patient can bear it.

A Mustard Leaf.—Soak in tepid water for a minute and apply it with a piece of linen or small towel over it.

Starch Poultice.—Take four tablespoonfuls of finely-powdered starch and one of boracic powder. Add a little cold water, drop by drop, mixing it into a smooth, thick paste. Pour the boiling water over it, stirring carefully all the time until it becomes a thick, clear jelly. Leave it to cool and then spread on old linen the size of affected part. Cover with gauze or muslin and apply it. This poultice is used for skin diseases such as eczema.

Blisters.—Wash the skin of the part to be blistered, and over a large area round as well, with soap and water, preparing it after with a little ether. Paint round the area of the blister with a little oil or vaseline to prevent the fluid running over the surrounding skin.

Paint on the fluid with a small camel-hair brush and cover with a circle of brown protective, keeping it in place with two strips of narrow adhesive plaster crossed over the circle.

If the blister has not risen within twelve hours apply a small poultice over the protective.

To Dress a Blister.—Snip at its most pendulous part with a pair of clean, sharp scissors and press out the fluid with a swab of cotton-wool. Apply boracic ointment spread on the smooth side of a piece of white lint cut the size of the blister, and keep it in place with two narrow strips of adhesive plaster crossed over it. Renew the dressing twice a day until it is healed.

BATHS

Always use a bath thermometer in taking the heat of the water, as no one can judge the temperature accurately with the hand.

Temperature	of hot bath, 98° to 106°	Fahrenheit.
,,	of warm bath, 92° to 98°	,,
,,	of tepid bath, 85° to 92°	,,
,,	of cold bath, 33° to 65°	,,

Time is almost as important as heat in the effect of a bath. Five to ten minutes is, as a rule, long enough for an invalid. Warm, dry towels must be ready to envelop the patient, and all unnecessary delay in drying and dressing after a bath should be avoided.

Alkaline Bath.—Add half an ounce of carbonate of soda to each gallon of water. Used for rheumatism.

Sulphur Bath.—Half an ounce of flowers of sulphur to each gallon of water. Used in cases of skin irritation.

Bran Baths.—Two ounces of bran to each gallon of water, mixing the bran with a small quantity of boiling water before adding it to the bath.

Mustard Bath.—An ounce or more of mustard to each gallon of water. Mix the mustard in a little cold water, and add it to the bath. This is ordered usually as a foot bath, and is excellent for headaches or cold in the head. The water should be as hot as possible. Add more hot water to maintain the heat, and the feet ought to be kept in until the skin is quite red. The patient ought to get into a warm bed immediately after, with hot bottles to keep up the heat.

Cold Sponging.—This is frequently ordered when the temperature of a patient reaches 104° or over. Plain cold water or water with some ice in it may be used. Take a small cot blanket and cover the patient with it, remove the nightgown and turn the patient on to his side, roll another small blanket under him, and proceed to sponge his back. Use a large sponge, and sponge from the neck downwards with long, even strokes. Sponge the back for five minutes and wipe with a soft towel, turn the patient on his back, and sponge the chest and abdomen in the same way, then the arms and legs, and last of all, with clean, fresh water, the face. The sponging ought to last about twenty minutes, but if the patient becomes blue and collapsed it must be discontinued at once. As all exertion ought to be avoided, it is better in these cases where the sponging is frequent to have nightdresses which fasten down the back like a pinafore; they are so easy to take off and put on.

The temperature should be taken both before and after the bath.

Tepid Sponging.—Sometimes tepid and sometimes hot water sponging is ordered to reduce the temperature. A little vinegar added to the water is very beneficial, especially in cases of phthisis.

NURSING CASES OF INFECTIOUS DISEASE

The nursing of infectious cases demands more intelligent and conscientious care than any other disease. If the case has to be nursed at home the first thing to be considered is the possibility of complete isolation.

The doctor should be called in as soon as there is any suspicion that the patient is suffering from some infectious disease.

In some cases there are no pronounced symptoms, and the patient is only slightly indisposed, the appearance of a rash being the first indication of any infectious trouble.

The room chosen for an infectious case should be in the most secluded part of the house; if possible the top floor should be isolated, and the nurse with the patient shut off from the other inmates of the house.

All superfluous rugs, hangings, and furniture should be removed from the isolated rooms, cupboards and drawers should be emptied, and only the things necessary for the nurse and patient kept in the rooms. Upholstered furniture should be avoided, as it is more difficult to disinfect.

The nurse should have her meals in her own room, and all utensils both for her use and the patient's should be kept apart and not washed with other dishes in the family kitchen. Invalid requisites should all be washed by the nurse herself.

She must realise her responsibility in preventing the spread of infection by taking every possible precaution. She must make up her mind to be isolated with her patient for the time. She must not go out in the dress she wears in the sick-room, and avoid sending letters by post. When the time comes for the patient to be disinfected the nurse must disinfect herself by taking a carbolic bath, and washing her hair and changing all her linen, &c.

Throughout the course of an infectious disease a sheet wrung out in carbolic 1 in 20 solution should be hung outside the patient's door, and kept wet continually.

All soiled linen should be soaked in a bath of 1 in 40 carbolic solution or in very strong lysol for some hours. They should then be washed and boiled before they can be considered free from infection.

Blankets and woollen garments which cannot be soaked and washed should be fumigated with sulphur or formaline.

The nurse should wear an overall in the sick-room, and take it off when she leaves the room. She should always have a basin of water with lysol ready to disinfect her hands. Each time she attends to the patient she must wash and disinfect her hands and arms, and always before she leaves the room.

The most common infectious diseases which can be nursed at home are chicken-pox, measles, German measles, mumps, whooping-cough, diphtheria, typhoid fever, scarlet fever, phthisis, and influenza.

Chicken-pox.—This is a very mild disease, common among children. The incubation period is from ten to sixteen days, and quarantine lasts until all the spots have entirely disappeared.

The rash usually appears on the second day, small pimples forming on the head, body, and limbs; later on the pimples form into scabs, which drop off when the skin is healed underneath. The child should be kept on a light diet, and given an aperient when necessary. The skin may be dusted with talc powder or white fuller's earth. The child should be kept in a well-ventilated room, but guarded against chills. After two or three days he might be allowed to go into the garden, but isolated until all the spots have disappeared.

Measles.—Measles usually begins with all the symptoms of a severe cold in the head. The period of incubation is from fourteen to seventeen days, and the rash comes out three or four days after the other symptoms have appeared; it begins on the face, neck, and arms, and feels slightly elevated above the skin.

The discharge from the mouth, nose, and eyes of a patient suffering from measles is very infectious, so that it is better to use pieces of soft rag which can be burnt immediately after use instead of handkerchiefs.

The temperature is often very high to begin with. The patient should be well covered up in bed, with a fire in his room night and day to ensure an even temperature.

Avoid giving an aperient in the first stage of the disease, as it is apt to bring on diarrhœa; if the patient is constipated a glycerine suppository will probably give relief. Give a very light diet, such as chicken-tea, Horlick's malted milk, barley water, peptonised milk, or whey.

If every care is taken to avoid a chill in the first stage of the disease the second stage will be quite easily got over, but in neglecting these precautions the after-effect of measles may be very serious. Pneumonia and bronchitis are common complications; inflammation of the eyes, discharge from the ears and nose, and convulsions may also occur.

The nurse must be on the watch for any rise of temperature, and all suspicious symptoms should be reported to the doctor at once.

When the patient is allowed to get up a bath should be given every day with a little Sanitas or Condy's fluid in it.

Good nourishing food must be given during convalescence, and the patient should have plenty of fresh air. The eyes must be protected from the sun, and reading by artificial light ought to be avoided for a month or two.

German Measles.—This is much less severe than English measles, and there is less danger from chills. The rash is similar, but is confined to the face and arms.

Mumps.—The period of incubation for mumps is from fourteen to twenty-five days, and quarantine from a month to six weeks after the swelling has gone down.

The patient should be kept in bed for two or three days and hot wool or flannel applied to the swollen glands. Avoid chills.

Sometimes the glands suppurate, and fever, with delirium, may develop, but this is unusual if every care is taken to keep the patient warm at the beginning of the disease.

As eating is very painful, the food should be soft and easy to swallow—bread and milk, soup, beaten-up eggs, custard, &c. All sour fruit should be avoided, as it increases the flow of saliva, and as the salivary glands are inflamed and swollen anything sour will cause much pain.

Whooping-cough.—The incubation is about a week and period of quarantine indefinite.

It is very infectious among children. The cough becomes more violent as the disease progresses, until the characteristic whoop appears. During the paroxysms of coughing the child suffers much, becomes blue in the face, and struggles for breath. Hold his head firmly with both hands and let him have fresh air. The paroxysm often ends by the child being sick, and this will relieve him for a time.

The child should be kept in bed so long as there is any rise of temperature, but he should be up and about as soon as it becomes normal. A change of air and good nourishing food will hasten the cure.

Diphtheria.—The period of incubation for diphtheria is from twelve hours to five days, and time of quarantine till all germs are gone from the throat. The first symptom is usually sore throat followed by swollen glands; and then an irregular greyish white patch of membrane appears on the tonsils and uvula, which are swollen and red.

There may or may not be a temperature. In bad cases there is a short, hard cough, with difficulty in breathing. The patient looks very ill, with blue lips, and has a restless, anxious appearance.

In nursing diphtheria at home the patient must be isolated at once and never left alone for a moment, night or day, until the doctor pronounces him out of danger. A trained fever nurse, who has had experience in nursing diphtheria, ought to be engaged, as the home nurse could not undertake the case unassisted, and she will learn more by watching a skilled nurse attending to a throat than by reading pages of description as to how it should be done.

The room should be well ventilated, with a fire in the grate night and day. The patient should be kept lying flat, with one low pillow for the head. The heart is usually very much affected by this disease, and sudden deaths have frequently occurred by the patient being allowed to sit up.

Special attention must be paid to the throat; it should be swabbed frequently with whatever lotion may be ordered. Cotton-wool swabs on sponge-holders are the best for this purpose, and burnt after use. The tongue should be held down with a tongue-depresser, and someone should hold a small lamp so that the nurse can see the throat quite easily. If a piece of membrane is loose, and covering the larynx so as to make breathing difficult the nurse should remove it with forceps. Sometimes a throat spray is ordered or syringing, but all these treatments require skill and experience, and should not be attempted by an amateur in such a serious illness as diphtheria.

In attending to the patient's throat the nurse must be very careful to protect her own eyes and mouth from any particles that may be coughed up.

The patient's feet and legs must be kept very warm, and he should have as much nourishment as possible—meat juice, chicken jelly, beaten-up eggs, milk, or whey, with stimulant if ordered by the doctor.

If a steam kettle is ordered the best way to concentrate the steam round the patient is to erect a tent at the head of the bed. A three-fold clothes-horse is the best thing for this purpose. It should be covered neatly all round with sheets fixed to it by drawing-pins, and then a smaller sheet should be stretched over the top of the screen, hanging a little over the front to form a canopy.

The steam kettle should be placed on a low stool or chair so that the steam from the spout is on a level with the patient. A steam kettle specially made for the purpose, with a long spout and spirit lamp underneath, should be used, and a reserve kettle of boiling water should always be ready to refill the steam kettle, so that the current of steam flows continuously.

Great care must be taken, when the patient is recovering, not to let him exert himself unnecessarily. For some time after he is better the nurse should wash him and do everything for him; and on sitting up he should be put first reclining against two pillows, and gradually add more pillows, getting him into an upright position.

As a rule the heart takes a year or more to recover from the poison of diphtheria, so that the patient ought to take things easily and be allowed extra nourishment for some time.

Scarlet Fever.—The incubation period is five or six days, and quarantine six to eight weeks. The rash appears on the neck, face, and breast, and commences as small points, which spread until the whole surface is red. It remains out for three or four days and then fades when desquamation begins to take place. The best way to prevent the particles of skin from flying about in the air and spreading infection is to anoint the patient all over daily with carbolic or eucalyptus oil.

In scarlet fever the throat mischief is sometimes very severe, and so painful that the patient is unable to swallow. Great attention must be paid to it, as the poison may spread to the ears and nose, and permanent deafness be the result.

The necessity of guarding against a chill during the convalescent stage is very important. Nephritis, dropsy, rheumatism, and other diseases may be feared as a consequence of any carelessness in this respect. The slightness of the attack of fever is no safeguard against the patient's susceptibility to contract any of the diseases which scarlet fever leaves.

When the desquamation is quite over the patient is usually kept in isolation for one more week, and should have a daily bath with carbolic or lysol in it. Particular attention must be paid to the hair, as the poison lingers about the roots, and is very difficult to get rid of.

As Bright's disease is a very common complication of scarlet fever during convalescence, the nurse must notice the urine carefully, the amount passed, and its appearance. Specimens put up for the doctor should be kept in clean bottles with the patient's name on the label.

Any puffiness round the eyes should be reported to the doctor at once, or any pain or swelling of the joints, pain in the chest, redness of the eyes, twitching of the face, or headaches. The nurse will be a great help to the doctor if she will notice any of these symptoms and report them to him at once.

The temperature should be taken twice a day for some time after the patient is well, but it need not be charted.

Typhoid Fever.—This fever demands more careful and constant nursing than any other. It is but slightly infectious through the air. The poison is chiefly in the intestinal discharges, the intestine being the seat of the attack.

The patient usually complains of weariness and headache, often some bleeding from the nose, and sometimes pain in the back and limbs; the temperature is pretty high, and the motion loose and light yellow in colour.

A little carbolic or lysol should be put in the bed-pan before use, and some more poured over the motion as soon as it is passed, and the bed-pan should be covered with a well-fitting lid. If the doctor wishes to see it, it must be kept in an isolated closet well covered up, and a towel soaked in 1 in 20 carbolic placed over it; but if not, it must be emptied at once, with plenty of disinfectant to flush the drain after.

Keep the patient in a strictly recumbent position, always with only one low pillow for his head. The sheet and one small blanket with a small sheet or cover will be sufficient covering if the temperature is very high. It is a good plan sometimes to put a large cradle over the patient's body to keep the bedclothes off him and allow the air to have free course round him. Care must be taken to keep his feet warm, however.

Wash the patient all over night and morning. Keep a blanket for this purpose, and roll the patient in it before removing the nightdress. Wash quickly and lightly and dry, but do not use any friction. Take great care when turning him over to wash his back so that he does not lift the lower part of his body, but make him lie heavily on the bed and roll him like a log. A little toilet vinegar added to the water will make the bath more refreshing.

Guard very carefully against bed-sores. Rub the lower part of the back, spine, hips, shoulders, elbows, and heels with spirit, and dust with powder. Put the patient on a water-bed if he is thin or if the bed is a little hard. The slightest sign of a bed-sore should be reported to the doctor at once. It may be taken as a bad symptom, indicating a lowering of the vitality.

In making the bed always have someone to assist, and also in lifting the patient on to the bed-pan, as he should never be allowed to lift himself.

When sponging the patient notice if there are any spots on the abdomen, and if there are pencil them round with a blue pencil so that the doctor will have no difficulty in finding them. These spots usually come out in groups and fade after two days. They invariably denote the spread of the disease. Later on in the disease, when the affected part is much ulcerated and inflamed, the walls of the intestine become thin, so that the importance of keeping the patient perfectly still and giving simple fluid diet can be understood. Any effort or movement, or any substance passing through the intestine, might cause perforation.

The temperature should be taken every four hours, and the relation of the pulse-rate to the temperature carefully noted. A sudden drop in the temperature should be reported at once. It may indicate hæmorrhage or it may only be the result of drugs taken to reduce the temperature.

If the patient becomes delirious he must never be left alone for a moment. If there is any blood in the motion don't give any more stimulant until the doctor has been told. If an ice-bag is ordered for hæmorrhage the best way to apply it is to place a cradle over the patient's body and suspend the ice-bag from it, letting it merely rest on the abdomen without its weight pressing on it. A piece of lint should be placed between the ice-bag and the skin.

As patients suffering from typhoid fever usually sleep a great deal and lie fairly quiet in bed, this mode of treatment is easily carried out.

If the patient is drowsy he may safely be roused every two hours for nourishment. All fluids must be carefully strained. If there is diarrhœa the milk should be boiled, then strained, and a little lime-water added to it. If there is constipation the milk must be diluted with plain water or barley water.

Sometimes peptonised milk is ordered. See p. 668.

About three pints of milk should be given in the twenty-four hours, with some meat jelly or beef-tea as well, and stimulant if ordered by the doctor. The milk may be flavoured with a little strong coffee, cocoa, or tea. All foods should be given cold or even iced.

Every possible attention must be paid to the patient's mouth during this fever. The teeth should be brushed frequently with a soft brush, and the tongue, gums, and roof of the mouth cleaned with glycerine and borax with a few drops of lemon juice added. Swab the mouth with a piece of cotton-wool on a sponge-holder or forceps, burning the swabs after use.

As soon as the temperature is down, the patient will become very hungry and crave for some solid food; but the doctor will satisfy himself that the intestine is well healed before he orders any change of diet. First he may have milk thickened with corn-flour or arrowroot, then thin bread and butter without crust; then custard; and about the fourteenth day, if the patient progresses favourably, he may have fish soufflé and thin minced chicken and so on. There is often much trouble caused by constipation during the convalescence. An enema with olive oil in it should be given every other day, and aperients according to the doctor's orders.

As the motions and urine of a typhoid patient have been known to contain the germ for some weeks after convalescence, care must be taken to disinfect, and the patient must use every precaution long after he is out of the doctor's hands.

Phthisis.—This is a very infectious disease, and one in which the patient ought to be as carefully isolated as any of the more virulent fevers.

This is difficult when the illness is prolonged and the patient feels well and is able to do a good deal of active work; but so long as there is active mischief in the lung and the pathological report of the sputum is positive, then the patient ought to be considered infectious and a source of danger to his friends—especially children.

Everything coming in contact with the patient should be disinfected, all clothing and bed-linen should be soaked in strong lysol or 1 in 20 carbolic before they are washed, and woollen garments fumigated. After a long case of phthisis the mattress and pillows should be fumigated and thoroughly done up or else destroyed.

Infection is most frequently spread through the expectoration, and this is comparatively harmless until it is dry. Then it is spread in the air in the form of dust, which is full of the germs of the disease.

A patient suffering from phthisis should never kiss anyone, and should be very careful in coughing or sneezing to use a piece of linen or Japanese handkerchief which can be burnt. In expectorating he should use a proper saliva flask with a little carbolic in it, or if in bed an ordinary sputum-cup.

In nursing acute phthisis the sick-room should be large and airy, with as much window space as possible. The windows should be wide open day and night, and the bed as near the window as it can conveniently be placed. All superfluous hangings and carpets should be dispensed with, and the room made to look pretty and bright by the wall-paper and colour of the woodwork instead of draperies. There should be one or two pictures, and plenty of flowers are always permissible.

Feeding and fresh air are the two great essentials in cases of this kind. When the temperature is very high the patient should be sponged with warm water and vinegar. All garments should be changed frequently, especially if the patient perspires much.

As a rule patients suffering from phthisis are of a bright and hopeful disposition, and are inclined to do far more than their strength will permit. Over-exertion must be guarded against, as it increases the circulation and raises the temperature, making the disease more active. The patient should be kept quiet and excitement avoided. Food should be given frequently during the day and once or twice in the night.

If hæmorrhage occurs keep the patient from moving, and try to allay his nervousness by doing everything for him calmly and steadily. An ice-bag on the chest and small pieces of ice to suck may comfort him and help to stop the hæmorrhage. The doctor will probably give an injection of morphia or order an opiate of some kind. A mild aperient should be given as soon as possible after the attack.

If the patient is ill for a long time and requires night nursing, some help will be necessary, as the disease becomes much more infectious as it advances, and the nurse who is tired is much more susceptible to infection than anyone. Indeed, the nurse who is in charge of a phthisical patient should have more hours off duty and have better food than nursing any other infectious case.

So many people say the nurse has nothing to do and is having such an easy time she does not require to go out. They forget that she is living in a poisoned atmosphere all the time she is with her patient, and is always in danger of contracting that most distressing disease herself.

Influenza.—A patient suffering from influenza, however slight, ought to stay in bed and be isolated for two or three days. If this is done the infection is less likely to spread. If the temperature is high, ammoniated quinine should be given, half a teaspoonful in water every four hours. Lemon or orange juice in soda-water should be taken freely with a light diet. If the cough is very troublesome and the chest painful, a mustard leaf on the chest might give relief, or rub the chest with eucalyptus oil. When the patient is convalescent a change of air is the best way to get rid of the poison, which is apt to linger for days and even weeks, causing much nerve exhaustion. Care should be taken to disinfect the bed and bedclothes and fumigate the room.

Disinfecting a Room.—To disinfect a room after an infectious illness proceed as follows:

Strip the room as bare as possible; remove all linen and utensils which can be washed and boiled. Scrub the floor and woodwork with soft soap and hot water, open all drawers and cupboards, and spread the contents about the room, then, before the room is dry, stop all outlets and crevices by pasting strips of paper over them. Take some rock sulphur, a quarter of a pound to every hundred cubic feet of air, break it up and put it on a metal dish, and pour a little methylated spirit over it before lighting. The metal dish should be placed in a wide, shallow vessel containing cold water. After lighting wait a minute to see if the sulphur begins to burn. Shut the door of the room and paste strips of paper round the crevices, stopping up the keyhole. Leave it for twelve hours, then open the windows wide for several hours after. Many people disinfect again by putting down basins of chloride of lime and sealing up the room for another twelve hours, but this would only be necessary after scarlet fever and phthisis.

Fumigation with formalin candles may be done in the same way as sulphur, allowing one big candle for every 100 cubic feet.

This process of disinfection is not sufficient for mattresses, pillows, and books after such cases as scarlet fever or phthisis. The former should be properly baked and then done up, and the latter should really be destroyed. It is better, after both these illnesses, to have the room repapered and painted.

TABLE OF INFECTIOUS DISEASES

Disease	*Incubation*	*Quarantine*
Chicken-pox . .	10 to 16 days	Until the scabs are gone
Measles . . .	8 to 18 days	4 to 6 weeks
Whooping-cough	5 to 14 days	Indefinite
Mumps	14 to 25 days	6 to 8 weeks
Scarlet fever .	1 to 8 days	6 to 8 weeks
Typhoid fever .	10 to 14 days	Indefinite
Diphtheria . .	1 to 3 days	Till all the germs are gone from the throat

TREATMENT OF WOUNDS

Cleanliness is the most important factor in the healing of wounds, and must be carried out in every detail.

Before dressing a wound see that everything likely to be required is ready and close at hand. A small table covered with a clean towel should be placed at a convenient distance from the patient's bed. Place on it two small basins with lotion, one for instruments such as scissors or forceps, and one for swabs for bathing the wound. The lotion for instruments should be carbolic 1 in 40; and for swabs carbolic 1 in 40, lysol—two teaspoonfuls to a pint of water, or boracic—one tablespoonful of boracic crystals to a pint of water. The water with which an antiseptic is diluted should always be boiled. For boracic lotion it is best to make a good quantity and keep it in a well-corked bottle; and carbolic should be made up in a strong solution 1 in 20, and an equal part of boiled water added to it at the time of dressing.

All materials used for dressing a wound should be kept wrapped up in a clean towel inside a tin box with a well-fitting lid. Gauze if used should be kept in a glass jar with a well-fitting stopper, or in a small tin box wrapped in a small towel. Boracic lint should be kept cut up in pieces the size required, also in a tin box. All these dressings with the wool could be kept in one fairly large tin box and brought to the patient's bedside at the time of dressing, but not exposed to the air until they are actually required. Have a shallow dish or receiver ready to put soiled dressings in, and when everything is ready wash your own hands and arms thoroughly, brushing the nails with a good hard brush.

Disinfect them in carbolic or lysol lotion, and don't dry them, but proceed at once to dress the wound. Spread a piece of white jaconette under the part to be dressed, with a clean dry towel over it. Wash the wound carefully with the lotion, and place a swab of gauze over the raw surface of the wound while the edges and surrounding skin are thoroughly cleaned.

Cut away any dead skin, and if the wound is on the head the hair should be shaved off over a considerable area round it.

In bathing the wound care must be taken not to use the same swab a second time, but each swab when done with should be put in the receiver. After the wound is dressed and the patient attended to all soiled dressings should be burned. When the wound is properly cleansed apply whatever dressing may have been ordered, gauze, boracic lint, or ointment, cover with a pad of white absorbent wool, and keep in place with a bandage. Suppurating wounds which require fomenting or poulticing should be cleansed in the above manner. If there is much discharge it may be necessary to bathe more freely. This may be done by placing a basin under the limb and irrigating the wound from above, either by free sponging or by using an irrigator. To apply a fomentation place a clean towel over a basin with the ends hanging over the edge, place on it the piece of boracic lint the size required, fold the towel over it, and pour boiling water on, wringing it as dry as possible. Apply to the wound and cover with a piece of jaconette ½-inch larger all round than the fomentation. Place a good pad of wool over that and keep in place with a bandage. A poultice may be applied over a wound with gauze or muslin between it and the wound, but never put jaconette or mackintosh over a poultice that is used for this purpose.

A wound that has been stitched and is expected to heal by first intention would not of course require elaborate dressing or bathing. The first time it is dressed all that is necessary is to have a fresh dry gauze dressing put on with a clean pad of wool and bandage. Then, the next time, the stitches will probably be removed and a small dry dressing with firm bandage applied for a week or so, gradually lessening the dressing and bandage until the affected part is quite healed.

Ulcers.—An ulcer is a raw discharging surface, resulting sometimes from bed-sores, burns, or bruised wounds. The first thing to do with an ulcer is to get the wound clean. Wash with lotion as described above, and foment at least twice a day—every four hours if there is much discharge.

A starch or a charcoal poultice is often very beneficial in these cases (see pp. 651 and 652).

Sometimes ulcers become chronic and are very difficult to heal. Changing the kind of dressing frequently often helps to hasten the recovery.

Red Lotion Dressing.—This is useful as a stimulant. Cut a piece of lint the exact size of the inside edge of the wound, not large enough to come over the edge (as red lotion is too irritating for the tender new skin forming round the edges of the wound). Soak it in the red lotion, wringing it dry. Then fit it neatly into the wound, the smooth side of the lint next the raw surface, cover with a piece of oilsilk or protective a little larger than the wound, place a pad of wool over it, and apply a bandage. For a bed-sore place a piece of dry boracic lint over it and keep in place with strips of adhesive strapping crossed over the middle of the dressing. This dressing must be changed twice a day.

Ichthyol Ointment Dressing.—Spread a fair-sized piece of surgeon's lint on the smooth side with a broad-bladed knife or spatula as if you were spreading butter on bread. Fold the lint and keep it in a tin box ready for use. To dress a wound cut the piece of spread lint the size of the wound (not larger), as the edges are apt to become sodden if a large ointment dressing is applied; cover with a pad of wool and bandage. If for a bed-sore cover with a piece of dry boracic lint and strap with strips of adhesive strapping. Zinc ointment, boracic, and hazeline ointment may be applied in the same way.

In all cases of ulcerated leg the limb must be kept absolutely at rest. After the dressing is done a well-padded splint should be applied, reaching from the thigh to the ankle, keeping the knee-joint at rest.

Cancer.—In dressing cancerous wounds, which often cover a large surface and discharge a great deal, care must be taken to place the patient in a position in which he will be most at ease, resting against pillows with his head turned away from the wound, so that he may not see it exposed. Be careful on removing the soiled dressing to soak off any parts that may be adherent. As these wounds bleed very freely, irrigate gently with warm boracic lotion, Condy's fluid, or weak Sanitas lotion. Apply an ointment dressing cut in several pieces, as it is easier to remove small pieces than one large one. The outside packing must be very carefully applied, so that the patient is comfortable and the discharge does not soak through to the nightdress or bedclothes.

Wood-wool is a useful packing in these cases. If the wound is very offensive a layer of Tenax or carbolised tow placed on the outside of the packing and not allowed to come in contact with the skin will help to counteract the smell. Bandages in these cases should be of old linen or calico, and all soiled dressings, bandages, &c., should be burned at once.

Abscesses, Boils, Carbuncles, and Whitlows should all be dressed in the same way as ulcers, and the wound cleansed with lotion and fomentations or poultices, applied two or three times a day.

Burns and Scalds.—The first thing to do if anyone is badly burned is to attend to the patient rather than to the wounds. First aid having been rendered at the seat of the accident, it will be the home nurse's chief care to get a bed ready in a warm room, plenty of blankets and hot-water bottles. The patient should be laid carefully on the bed and covered up with blankets, with hot bottles to his feet and sides. Brandy should be given with a little water in it; the bed should be raised at the bottom on blocks or bricks if the patient is faint. Get someone to watch by the bedside all the time while you get the materials, &c., ready for dressing the burns. Clean, soft old linen spread with picric ointment is quite the best dressing, but if it can't be procured for the first dressing boracic ointment or carron oil will do instead. Remove the patient's clothes, cutting them when absolutely necessary, wash the charred parts with warm water and a little soap, bathing afterwards with warm boracic lotion. Apply the dressing, covering with cotton-wool, bandaging lightly, just sufficiently to keep the dressing in place. If the legs are burned raise them on pillows and keep the bedclothes off by means of a cradle.

Burns and scalds should be dressed once a day for the first two days; then, when the burnt tissue begins to slough and there is more discharge, the dressing should be done more frequently. When the patient has recovered from the shock sufficiently to have a boracic bath it will hasten the healing process. Let him lie in the bath from ten to twenty minutes, keeping up the temperature of the water by adding more hot water and more boracic powder from time to time.

The wounds must be dressed as quickly as possible after the bath and the patient put back to bed. Some stimulant, such as coffee or tea, should be given to prevent collapse.

It should be remembered always that the chief danger from a burn arises from shock producing heart failure. Especially is this so in young children, where what might appear to be a very trifling burn or scald has been the cause of death. It is always safer to err by being over-cautious where a child is concerned, and if only very slightly burned or scalded the child should be put to bed and kept very warm and quiet. If there is any sign of collapse a small quantity of brandy should be given in a little milk. The doctor should be sent for and the child carefully watched until all fear of danger is over. Aperients should be given with caution, as diarrhœa is a common complication.

SPECIAL TREATMENTS

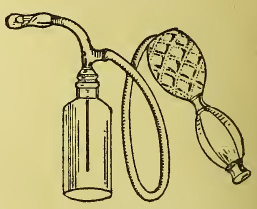
For Eyes.—In bathing eyes use warm boracic lotion. Bathe carefully with swabs of gauze or absorbent wool. In cases of inflammation, apply hot fomentations every two or four hours. If there is discharge, great care must be taken to prevent it spreading to the unaffected eye. Before irrrigating, take a swab wrung out in lotion and remove all discharge surrounding the eye. Then with another swab cover up the unaffected eye. Place a mackintosh with a clean towel over the pillow, and let the patient lie down with his head turned slightly to the affected side. Let him hold a flat receiver close to the side of his face, so that the water from the irrigator will run down from the eye into it. A proper china irrigator with a small glass nozzle at the end of the tube is the best thing to use; but if this cannot be procured syphon a piece of absorbent wool in a breakfast cup of warm boracic lotion by placing one end of the wool in the lotion and the other end, neatly pointed, brought over the edge so that when the cup is slightly tilted a thin, steady stream of lotion can be carefully directed on to the eye.

Hold the eyelids open with one hand and guide the irrigator with the other, bathing in this way until all the discharge has disappeared. Then apply the dressing.

If ointment is ordered it should be applied with a fine camel-hair brush, gently painting inside the lower and upper lid.

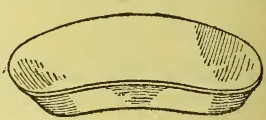
Drops should be put in with a proper glass dropper, dropping them into the outside corner of the eye, as, if they are put into the inner corner, they are apt to get into the tear duct and never get over the surface of the eye.

Throat.—To spray a throat it is important to do it before and not after food. Use a tongue-depresser or bent spoon-handle. Spray well to the back of the throat, getting the patient to draw in his breath each time the ball of the spray is compressed. To swab a throat, place the patient so that the light falls on the back of the throat. Use a camel-hair throat-brush dipped in the application, then, while depressing the tongue with a bent spoon-handle or depresser, brush quickly all round the throat. Cleanse the brush thoroughly before applying a second time. In some cases of sore throat, such as diphtheria or scarlet fever, it is better to use swabs of cotton-wool on sponge-holders, and these can be burned immediately after use.



Throat Spray.

The Ear.—To syringe the ear use warm boracic lotion and a large glass syringe; tuck a piece of jaconette carefully round the patient's neck, and hold a tray, preferably kidney-shaped, close against the neck under the affected ear. Be careful to expel every air-bubble from the syringe by compressing it with the point upwards until the lotion comes to the point.



Kidney-shaped Tray.

Pass the fluid along the upper wall of the ear slowly and gently, and syringe until the lotion runs out quite clear and clean.

To put in drops let the patient lie on his unaffected side and drop in the warm oil or warm application with a medicine-dropper or camel-hair brush; let the patient keep his head in the same position for a minute or two afterwards. Put a small piece of absorbent wool into the ear to prevent the oil running out and soiling the pillow.

In cases of acute earache the inside core of a boiled or baked onion put into the ear as hot as the patient is able to bear it will give relief, or one or two drops of laudanum in warm oil is often efficacious.

Nose.—In syringing the nose a ball nasal syringe should be used with a vulcanite mount, and the lotion according to what the doctor orders.

Ball Nasal Syringe.

NURSING CASES OF FRACTURE

In nursing a case of fractured leg the mattress should be firm and the bed level. In hospitals boards are usually put across the bed under the mattress to make it as unyielding as possible. The injured limb must be kept absolutely at rest to enable the broken bones to unite.

In a case of fractured thigh the patient should have only one low pillow and should lie on his back. The injured leg is put up by the doctor on a long splint with an extension. Blocks are placed under the bed at the foot, and weights are suspended from the injured leg by a cord over a pulley. Care must be taken not to jerk the weight or cause any movement to the limb.

Guard against bed-sores, keep the draw-sheet very smooth under the patient, and wash and rub his back very carefully twice a day.

Fractured Spine.—It is best to nurse a case of fractured spine on a large water-bed. It is almost impossible to prevent bed-sores, and only by the most careful nursing can one hope to alleviate a little the various discomforts from complications, and often acute suffering in these cases.

The doctor will probably superintend the first lifting and changing of the patient, and he ought to be placed under the care of two fully qualified nurses until the dangers of the first few weeks are over.

It will depend on the extent of the injury how much paralysis may result, but the chief point in nursing is to be able to place the patient in the least uncomfortable and painful position. Guard against bed-sores, and observe and report on every change in the patient's condition.

Notice any head symptoms, want of sleep, jerking of limbs, control of sphincters, amount of urine passed, if there be vomiting, and the appearance of it, rise of temperature, cough or any chest trouble.

When the patient has got over the first shock of the accident and the nurse has discovered for herself how to make him as comfortable as his condition will permit, she must devote all her energies to making his life in the sick-room as hopeful and bright as possible. There will be days and days of depression to fight against, and hours of suffering with sleepless nights, but there will be bright days also, and hope will revive.

In the summer, when the patient can be carried out to the garden or wheeled out in a spinal chair, it will be comparatively easy to relieve the monotony of his days; but in the long winter days it will be the nurse's duty to bring the outside life and interests as much as possible into the sick-room.

Fractured Ribs.—This is a very common result of an accident.

The ribs should be strapped with adhesive strapping about an inch wide, extending from the breastbone over the injured ribs to the spine. Four or five strips of strapping will be necessary; over it a roller bandage 4 to 6 inches wide should be applied fairly firmly round the chest.

The patient will probably be most comfortable lying on the injured side, as in cases of pleurisy. The nurse should watch carefully for any appearance of hæmorrhage, as there is always a danger of the lung being injured by the broken ends of the ribs.

Concussion or Injury to the Head.—These cases should be kept in a quiet, darkened room. An ice-bag should be applied to the head and the patient kept on a low fluid diet until all fear of meningitis has subsided. An aperient should be given soon after the accident; the doctor will probably order calomel, to be followed by a dose of saline, such as seidlitz powder.

Observe and report carefully on the patient's position in bed—whether the head is thrown back or not. Notice if the eyes twitch, if there is any hæmorrhage from the nose or ears, the amount of urine passed, vomiting, or if there is any paralysis.

During the convalescence the patient should be guarded against excitement or nerve strain; and even after he is well he should be carefully watched, as brain injuries often become apparent long after the accident has taken place.

Fractured Arm and Collar-Bone.—After the bones are set little can be done in the way of nursing except to see that the injured arm is properly supported by a triangular sling.

Always support the injured arm when drawing off or putting on the coat, care being taken when taking the coat off to remove the uninjured arm from its sleeve first, and in putting on to put the injured arm into the sleeve first.

NURSING OF SICK CHILDREN

The nursing of sick children requires infinitely more knowledge, skill, observation, and patience than the nursing of adult patients.

In acute illnesses the child should always be placed under the care of a fully qualified nurse, as a mother is not always able to act with the requisite firmness and decision necessary on occasions of urgency and danger.

Children's illnesses usually run an irregular and rapid course. They will often, at a crisis, lose all rallying power and collapse almost without warning. On the other hand, they will struggle through illnesses which would probably be fatal to an adult.

Each case must be watched with the greatest care, and treatments altered and modified according to the effects produced. If one remedy fails, no time must be wasted, but another tried at once. A child's life may hang in the balance for days, but there is always a hope of recovery even when things look at their worst. The nurse must never give up or lose heart.

Food, cleanliness, sleep, fresh air, and light are all important to the child's welfare.

Food.—Generally speaking children would recover more rapidly if their tastes with regard to food were consulted a little more than is sometimes the case. A child's appetite should be tempted by the choice and variety of the food given and by the dainty and attractive way in which it is served.

Some children will refuse a glass of milk, but will take it quite readily if it is nicely warmed with a little tea and sugar added to it, and it is served in a cup and saucer on a little tray as for a grown-up person. A resourceful nurse will soon discover the best ways of tempting her little patient to eat.

In all cases where the temperature is high fluids only should be given. Whey or Horlick's malted milk should be given instead of plain milk, which is too heavy for a feverish child to digest.

As soon as the temperature is down toast and butter, lightly boiled or poached egg, and baked apples may be added to the diet; and later on custard, fish, and chicken. The food should be a subject of careful study, and the nature of the illness and condition of the child duly considered. No long periods should elapse between the meals; but the child should be fed at regular intervals during the day and once or twice in the night.

The Toilet.—Next to the food, but just as important, is the cleanliness of the child. The overwhelming prevalence of bacterial diseases among children renders cleanliness in every detail of their lives essential. Not only is cleanliness of the body and clothing required, but of the surroundings and of all who come in intimate contact with the child. Especially important is it to exclude all risk of tuberculous infection from nurse, relations, or friends.

The little invalid should be bathed or washed all over twice a day. The very best soap should be used, as the child's skin is very tender and easily chafed. The towels should be soft and fine, and great care must be taken in drying the child, especially in the folds of the skin, round the neck, under the arms, and in the groin. After drying the skin should be dusted with a fine powder. The child's teeth should be brushed two or three times a day, and the mouth and tongue kept clean with a little glycerine and borax. The hair should be well brushed and combed every morning and evening, and a little rosemary wash rubbed into the scalp occasionally will help to prevent the hair falling off, which it so often does after a severe illness.

As children have a tendency to throw off their bedclothes if they feel too warm it is best to have their nightdresses made of fine flannel or nun's veiling. As a rule the child is very susceptible to his surroundings, so that great care should be taken to make everything in the sick-room as pretty as possible. The bedclothes should be changed frequently and kept spotlessly clean, the child's nightdress should be changed two or three times a week, and one kept for day and one for night use. A soft muslin pinafore may be worn over the nightdress, and often gives great pleasure to the child who loves pretty things.

Air, Ventilation, &c.—The choice of room for a child with its light, heat, and ventilation would be the same as for an adult patient.

No definite rules can be laid down for nursing particular diseases in children. Remedies and applications are the same as for an adult patient, only they should be modified according to the temperament of the child. An unpleasant or painful treatment may do far more harm than good if the child is terrified every time it has to be repeated. The great point in nursing children is to understand them, using the most suitable treatment for the case.

To lower a high temperature, if the child objects to sponging inject three or four ounces of warm water or saline fluid into the rectum. This may be given without disturbing the child in the same way that a nutrient enema is given (see p. 650), and will soon lower the temperature and allay thirst. The temperature of the fluid should be about 90° the first time, and if repeated it may be given at a lower temperature, 80° to 85° F.

In convalescence a child's spirits soon shake themselves free of invalid ways; but it is better to go slowly and avoid any complications caused by a premature freedom from restraint. A change of air to the sea or country is always advisable; plenty of good, nourishing food, an adequate amount of sleep and exercise, and the little invalid will soon be restored to health.

NURSING OF CHRONIC CASES

Paralysis.—In many homes the nursing of a chronic invalid forms part of the day's work, and the invalid's room is, and perhaps has been for years, the centre of loving interest and care.

In cases of paralysis where the patient is quite helpless the nursing is heavy and pretty constant although not anxious work. The most important points to be attended to are the scrupulous cleanliness of the patient and bed, and the ventilation of the room.

If the patient is incontinent the draw-sheet should be changed each time the bed is wet. Short draw-sheets are the best to use in these cases, as it is quite impossible to draw it through and tuck the wet part under the mattress. The smell of urine is very unwholesome, and it would be difficult to keep the atmosphere of the room fresh. The back and hips should be washed with warm water and soap when the draw-sheet is changed, and rubbed well with spirit, and either dusted with zinc and starch powder or rubbed with zinc ointment.

In paralysis where the circulation is much impeded it is necessary to keep the patient very warm. It is true he does not feel cold, but he may suffer from its effects by being unable to digest his food properly, and kidney and other complications may be the result. There should aways be a fire in the room, and the windows should be open from the top night and day.

In putting hot bottles into the bed care must be taken to have covers on them, as paralysed patients are easily burned, and the circulation being bad the slightest burn is difficult to heal.

The prevention of bed-sores is extremely difficult; a water-bed will be a great comfort and help to avoid the pressure. The position of the patient should be changed frequently. He should be kept first on one side with a firm pillow down his back to keep him in position, and then on the other side supported in the same way. Put small pads between the knees and ankles to prevent them rubbing and causing sores.

To feed a helpless patient put his head in a comfortable position, turning it a little to the side, put a soft table-napkin under his chin and feed with a small spoon. Plenty of time should be allowed, as there is often much difficulty in swallowing, and the patient may cough and choke if hurried too much.

In nursing an unconscious patient the same care must be exercised in all that is said and done as if he had all his faculties. One can never tell how much penetrates beneath an apparently unconscious exterior, and it may be that the daily care and attention lovingly bestowed on the body of an unconscious patient may bring untold peace and happiness to his soul.

Chronic Heart Cases.—In nursing these cases there can be no definite rules, only a few suggestions can be made as to what might be helpful.

The patient should be encouraged to be up and about as much as possible, and be allowed to do everything for himself within reason. He may wash and dress himself with a little assistance, except on the days when he has a bad attack or is very breathless after a bad night or any unusual exertions.

Restoratives should always be ready at hand, but not so evident that the thought of an attack is always presented to the patient's mind—a little brandy, a medicine glass, sal volatile, smelling-salts, and whatever restorative the patient is accustomed to.

If the patient is entirely confined to bed his room should be as large and airy as possible, and the windows kept well opened. There should be a bell within easy reach of the bed, or an electric bell fixed up so that if he is alone for a short time he can summon assistance at once if necessary.

All chronic cases should have as much change and variety in their lives as it is possible to give them. A wheel carrying-chair, adapted for taking invalids down and upstairs with the greatest ease and comfort, would be a boon in many a home where there is a difficulty in having the patient moved. It can be managed by one person. In this way the invalid could be wheeled downstairs and out into the garden if fine, or moved to different parts of the house. If the sitting posture is tiring and uncomfortable he should be laid on a couch for a time and put back in the chair to be wheeled upstairs. All these changes mean a certain amount of labour, but the trouble will be amply repaid by the benefit the patient will derive from them.


Wheel Carrying-chair.

Convalescence.—When the acute stage of an illness is over great care and watchfulness will still be necessary until the patient has regained his lost strength. He must be encouraged in his efforts to get well by being allowed to become gradually more and more independent of his nurse.

Special attention should be paid to the food of a convalescent. His likes and dislikes should be considered, although he should not be consulted about his diet.

On getting up for the first time he should not be fully dressed, but wrapped in a dressing-gown with rugs round him. He will probably feel very weak and faint, and should not sit up for more than fifteen to twenty minutes, the length of time increasing daily until he is stronger.

Friends should be admitted with caution, and should never be allowed to stay longer than fifteen to twenty minutes, and two friends at the most on one day. A change of air and scene is always advisable after a long illness, and long after he has resumed his ordinary occupations the convalescent should be encouraged to rest in the afternoons and retire early to bed. As the nervous system is always the last to recover tone, quiet and freedom from strain, with good, nourishing food, will help to ensure a complete recovery.

Care of the Dead.—The nurse who has nursed her patient through the last illness will esteem it a privilege to perform the last simple offices.

When all is over the eyes should be gently closed and the fingers held over the lids for a minute or two; if the pressure is not sufficient pads of wet cotton-wool should be laid over the eyelids and removed later. A firm pad or small book should be placed under the chin to prevent the jaw from dropping. Half an hour or more should elapse before washing, in the meantime everything likely to be required should be got ready and the room tidied.

The fire should be removed and fireplace done up. All invalid requisites should be removed, medicine bottles emptied and put away.

Have ready two clean sheets, one pillow-case, nightdress, white stockings, a soft, fine handkerchief, warm water, soap, towels, and patient's own sponge, comb, and brush, &c. Wash quickly under cover of the blanket in the same way as if the patient were alive. See that the finger- and toe-nails are absolutely clean, and trim them if necessary.

Plug the intestine with a long strip of absorbent wool, using dressing-forceps or the blunt end of a pencil. Put on a clean nightdress and white stockings, and arrange the hair neatly. Roll in a clean under-sheet in the same way as in making a bed for a helpless patient, removing draw-sheet, mackintosh, and under-blanket. Put on a clean pillow-case and place the body in the middle of the bed; straighten the limbs, folding the hands over the chest.

Put on the clean top sheet, removing the soiled one, fold the sheet back over the chest and let it hang over the sides of the bed. Cover the face with a fine handkerchief.

Remove all soiled linen from the room, empty all slops, and put a bowl of strong Condy's fluid in a convenient corner. Dust the room carefully, and leave nothing lying about. Arrange some fresh flowers, and put clean white covers on table and dressing-table. Leave the window open about two inches at the top. When death has been due to some infectious disease the top sheet should be wrung out in carbolic or lysol and water and laid over the bed.

Sister Matilda.

INVALID COOKERY

The choice and preparation of food for those who are ill or convalescent are subjects requiring very careful consideration and study. A special attention to diet is one of the leading features in the modern treatment of disease, and in many cases the proper selection and preparation of food, both fluid and solid, are of greater importance than the use of medicine.

There is perhaps no branch of her work where the nurse can be of more service to the doctor than in her ability to feed the patient. In order to do this well she ought to have some accurate knowledge of the physical action of different foods in the body, and an understanding of what the system requires to maintain it during acute illness and build up the tissues during convalescence.

The actual cooking of the food is not difficult, in fact anyone with a fair amount of common sense, who follows a reliable recipe accurately and with care and thought, should succeed in making the dishes required. There are, however, many other details connected with invalid cookery which cannot be learned from books, a sort of feeling for and sympathy with the patient, an understanding of his likes and dislikes, which perhaps can only come to those who have suffered themselves or had experience at a bedside.

There are, alas! many who perish simply because no one seems to know how to feed them properly, and many more whose illness and convalescence are drawn out to an unnecessary length through their inability to obtain the food suited to their enfeebled powers. So, if we wish to succeed in avoiding this loss of this strength and even loss of life, we must learn how to offer nourishment to our sick in its most pleasing and nourishing form and in a quantity suited to their requirements.

In all serious cases the choice of food lies entirely with the doctor, and even during convalescence the diet is often very strictly prescribed. In these circumstances the doctor's wishes must be faithfully followed, as much unnecessary suffering may be caused by giving forbidden food. At the same time there must not be a blind following; the one who is acting as nurse to the patient has the best chance of judging of his likes and dislikes and of the effect of different foods on his system, and she ought to be able to give an intelligent report to the doctor of such details, and understand how far she may be permitted to humour his fancies, or make any change in the prescribed diet.

At other times, and especially during convalescence, the feeding is left in the hands of those who are doing the nursing. It is then that all one's skill and ingenuity are required to tempt a feeble, and very often capricious, appetite.

The transition from a fever or fluid diet to something more solid must be very gradual, as the digestive organs take some time to regain their normal activity.

All materials used must be of the very best, as there is always less nourishment in inferior food. This does not necessitate extravagant luxuries, in fact simple foods in season are often more palatable and wholesome than out-of-the-way delicacies, but let everything be good of its kind, and above all fresh and free from taint.

The invalid's tastes and fancies should be considered as far as possible, and these can generally be found out without actually asking him what he will have for each meal. It is always much better if a dish can come as a surprise.

Then again variety must be studied, and because a certain dish has been liked once, this must be no reason for repeating it too soon or too often. The same dish should not be given a second time if it can be avoided, and then not without making some little change in the manner of presenting it.

As a rule re-cooked food, especially meat, fish, and vegetables, are unsuitable, although sometimes a dish once served hot may be served up again in a cold form. For this reason invalid cookery should always be done in small quantities, and when a chicken or such like has to be bought specially it is better to cut it in half or even smaller pieces, and cook it in two or three different ways. For instance, half the white meat of a chicken might be stewed or steamed for one meal, the other half made into a cream or soufflé for another meal, and the legs and bones, &c., used to make soup or broth.

With regard to the actual cooking, the greatest cleanliness and daintiness must be observed, and when possible, and especially if the illness is likely to be a long one, it is better to have a special set of saucepans. The palate of a sick person is extremely sensitive, and ever ready to detect any flavour that is not meant to be there. The cooking should never be done in sight of the patient, although it is a good plan to have some arrangement, such as a gas-ring, in an adjoining room where simple articles may be prepared, or drinks heated.

Seasoning should be of the very simplest, and any special instructions in this respect carefully followed. The food should be tasted *before* it is brought into the sick-room.

Let all hot dishes be absolutely hot, as anything lukewarm is usually most unpalatable. Then serve them punctually at the time expected. Appetite fails if a meal is long delayed, and an invalid should never be allowed to become exhausted through long waiting. Anyone confined to a sick-room has little else to do than watch the clock, and if in a weak and perhaps nervous state, "a few minutes late" makes all the difference, and may be the cause of the food being refused altogether. When catering for the sick it is always a good plan to have some little thing in readiness, such as soup or meat jelly, which can be given to commence a meal, or even at an odd time, and thus avoid that feeling of exhaustion which comes through lack of nourishment.

The manner in which the food is served is also of great importance, and this must never be done in an untidy and careless fashion. The patient himself should first be made ready to receive the meal. If he is in bed, the pillows should be shaken up and comfortably arranged, and sometimes the sponging of the face and hands, and even a little extra airing of the room, will help to promote appetite.

Then care must be taken to make the tray dainty and inviting-looking. Spread it first with a spotless cloth and then place on it the necessary silver and glass, all looking as bright as possible. Do not overcrowd the tray, but put on it all that will be required for the first course at anyrate. A small serviette and salt-cellar must not be forgotten, and a few flowers will often help to brighten the repast.

Choose the daintiest dishes for serving, and arrange the food as neatly as possible. Never serve anything in large quantities, and always remember that a small pudding or a small jelly, made specially, always looks neater and will be more appreciated than a helping taken from a larger dish. When serving liquids do not fill the cup or basin too full, and on no account must any be spilt in the saucer.

When once the meal is served see that the invalid is allowed to enjoy it in peace and comfort and without hurry of any kind. Then when it is finished remove the tray and all traces of eating. Food should never be kept in a sick-room, with the exception of any fruit or other delicacy which has been brought as a present to the invalid, and which may be left for a short time before being removed to a cooler place; or in the case of anyone who has to be left alone for any length of time, when the necessary refreshment must be put within easy reach.

These little details may seem trivial to one in health, but it must be remembered that the horizon of the sick-room is a very limited one. To anyone confined to it the taking of food is among the chief events of the day, and it means such a lot to the invalid to know that someone has given thought and care to the preparation of his meal.

Space will not permit of many recipes being given, but it is hoped that the following, along with the additional hints and suggestions, will help towards the preparing of many useful dishes.

SOUPS

Soups and broths if well made are valuable for their restorative properties. As a rule clear soups and meat teas are considered more digestible than purées, and soups that are thickened with some farinaceous substance; but soups with milk, cream, or eggs are useful on account of the additional nourishment they contain.

Invalid meat soups should be made from fresh meat only, and not from stock drawn from a stock-pot. It is generally better to make these the day before they are required in order that any grease may have time to rise to the surface and be removed. Beef teas and other meat teas are, however, an exception to this rule, as they should be freshly made.

The flavouring should be as simple as possible, in many cases a little salt being sufficient. Vegetable flavouring should only be added when allowed and when the digestive organs are not in a very weak state.

Before serving the soup be most particular to see that all fat is removed from the surface. When in the form of a jelly this is easily done with a spoon dipped in boiling water, but if liquid, small pieces of kitchen paper must be drawn over the surface.

Soup is best served in a little basin with a lid, or, failing this, use a cup and saucer in preference to a plate, as the soup will keep longer hot.

Serve with the soup, and on a plate at the side, a neat piece of bread, some well-made toast cut in strips or dice, a few plain biscuits, or one or two rusks, according to fancy.

If toast is selected see that it is properly made, and not simply bread half browned, or blackened on the outside and a flabby sort of dough in the middle, which is much more indigestible than plain bread.

To Make Toast

Bread for toasting should be not less than a day old, and of a close and light texture. Cut it about one-third of an inch in thickness and then toast it in front of a clear, bright fire or under the grill of a gas stove, allowing it to dry slowly and become a nice uniform brown colour on both sides. Stand it on end until cold and then serve at once. If the toast is wished very hard and crisp, dry the bread in a cool oven a short time before toasting it.

Beef-tea

(1) *Proportions.*—To ½ lb. beef allow ½ pt. cold water and a pinch of salt.

Method.—Choose good juicy beef, freshly cut from the buttock, top-side, or rump. Wipe the meat quickly with a damp cloth, cut it in thin slices, and then scrape or shred it down finely with a knife, removing all skin and fat. Put this shredded meat into a clean lined saucepan with the proper proportion of water and salt, and if time permits allow it to soak for ½ hour, or until the water turns a bright red colour. Then heat slowly over the fire, pressing the meat well with the back of a wooden spoon, until the liquid turns a rich brown colour. On no account must the beef-tea boil. When ready strain through a fairly coarse strainer (unless clear beef-tea is wanted, when muslin must be used), remove all grease from the top, taste if sufficiently seasoned, and it is ready for serving.

(2) Another way of making beef-tea, which is better if a larger quantity than ½ lb. of meat is being used, is to put the different ingredients into a jar, to cover it securely, and then to steam or cook in a slow oven for 3 or 4 hours. Or, a double saucepan may be used for cooking it. The beef-tea ought to be stirred once or twice during this time to prevent the meat forming into a cake.

How to Vary Beef-tea.—The beef-tea may be made more savoury by cooking along with it a few pieces of flavouring vegetables or a small bunch of herbs, but this can only be done when beef-tea is made by the slower method (2).

If a more substantial soup is required the beef-tea may be thickened by adding to it a small quantity of crushed tapioca. This must be cooked first in a small quantity of water until it turns clear, and then the hot beef-tea poured on to it. Or, if preferred, a little well-cooked rice may be added to the beef-tea or a little cooked Italian paste to make a variety.

Then again, the beef-tea may be made more nourishing by the addition of one or two table-spoonfuls of cream, or the yolk of an egg, or more strengthening if 2 or 3 ozs. of raw beef, pounded and sieved, is stirred into it just before serving. The combination of beef-tea with hot milk or gruel will also make a very strengthening drink.

Note.—Mutton, veal, or chicken tea can be made in the same way as beef-tea, preferably by method (2), but the meat used must be very lean. A mixture of two different kinds of meat together makes a nice variety.

Raw Beef-tea

Prepare the meat as above and use the same proportions of water. Allow the meat to soak in the water for 1 hour, pressing it from time to time with a spoon or fork. Strain through a fine strainer and serve in a coloured glass to disguise the colour. This beef-tea should be made fresh each time it is wanted, and 2 oz. of beef is generally sufficient. It is only given under the doctor's orders, and is frequently added to other drinks, such as gruel, Benger's food, &c.

Mutton Broth

Proportions.—To 1 lb. lean mutton allow $1\frac{1}{2}$ pt. cold water, 1 des.-sp. rice, 1 tea-sp. chopped parsley, and a little salt.

Method.—A piece of mutton from the neck or knuckle may be used. Wipe the meat and cut it in small pieces away from the bone, removing as much of the fat as possible. Put the meat and bone into a saucepan with the water and salt and bring them slowly to the boil. Then simmer slowly from 2 to 3 hours, removing the scum when necessary. When ready strain and stand until cold. Then carefully remove all fat from the top of the liquid, return it to a clean saucepan with the rice well washed, and cook again until the rice is soft. Add the parsley very finely chopped and seasoning to taste.

How to Vary Mutton Broth.—A more substantial dish may be made by serving small pieces of the mutton in the broth. In this case the rice, or some fine pearl barley, may be cooked along with the meat, and simply the bones lifted out, and the chopped parsley added before serving. The addition of a few finely-cut vegetables will make a more savoury broth. A little finely-shred celery is always a wholesome addition if the flavour is liked.

Veal or Chicken Broth

These can be made in the same way as Mutton Broth. The inferior parts, such as the legs and carcase of the chicken, may be used; they must be well broken up. A mixture of meats is also good.

Fish Soup

Ingredients.—1 lb. white fish, 1 pt. cold water, 1 gill milk, 1 des.-sp. butter, 1 tea-sp. flour, 1 tea-sp. chopped parsley, pepper, and salt.

Method.—Wash the fish carefully and cut it in small pieces, removing any dark-coloured skin. Put it into a lined saucepan with the water and a little salt and bring slowly to the boil. Remove all scum, and as soon as the fish appears cooked lift out a few pieces free from skin and bone and put them on one side. Allow the remainder to cook slowly about 1 hour, and strain. Then melt the butter in a clean saucepan, add to it the flour, and mix smoothly together. Pour in the fish liquid and milk and stir constantly until boiling. Then add the pieces of fish that were reserved, the chopped parsley, and seasoning to taste. Cook a minute or two longer and serve.

Note.—A richer soup may be made by beating up the yolk of egg in the soup basin and pouring the hot soup gradually on to it. A more savoury one, by adding flavouring vegetables to the soup while cooking it.

FISH

Fish is one of the lightest forms of solid food, and a valuable article of diet for invalids.

White fish is more digestible than the oily kinds, such as herring, mackerel, and salmon, and among the most suitable kinds may be named, whiting, sole, smelts, haddock, and plaice. The whiting is particularly tender and delicate in flavour, and is less expensive than the sole; it is frequently called the "chicken of the sea." Oysters also are nutritious, and are considered very easy of digestion, particularly in their raw state, but they are not liked by everyone.

The fish used must be of undoubted freshness, and when possible should be filleted or made free from skin and bone before serving.

Steaming is one of the best ways of cooking fish for an invalid. Broiling is also good, but frying should as a rule be avoided, unless the fish can be made very crisp and free from grease. Fish prepared in the form of a cream, soufflé, or quenelles, is also light and delicate for anyone with a weak digestion.

White sauce should not be served with the fish when the lightest form of nourishment is wanted, as it tends to make the dish richer and heavier, but if well made may be given to those of a stronger digestion.

Salt and lemon-juice are the safest and simplest seasonings, and the latter helps to make the fish whiter.

Most fish dishes are improved by being garnished with a little parsley and thinly-sliced lemon.

To Steam Fish

Take a small quantity of filleted fish, wipe it, and cut it in neat pieces. Place these on a greased plate, season with salt and lemon-juice, cover with greased paper, and put a second plate or saucepan lid on the top. Place this over a saucepan containing boiling water, and keep the water steadily boiling until the fish has quite lost its transparent appearance. It will require about 20 minutes. When ready serve the fish on a clean hot dish, pouring the liquid which has run from it over and round. Dry toast or a little thin bread and butter may be served separately.

Note.—A mutton chop may be cooked in the same way.

A Fish Soufflé

Ingredients.—½ lb. uncooked white fish, 1 large tab.-sp. bread-crumbs, a small piece of butter, 2 tab.-sps. milk, seasoning, and 1 egg.

Method.—Shred the fish finely with a knife, and if possible pound it in a mortar. Put the milk into a saucepan with a piece of butter the size of a walnut and heat them over the fire. Add the bread-crumbs and cook a few minutes until these swell and absorb the milk. Add this bread panada to the fish and rub all through a wire sieve, being careful to scrape the sieve underneath. Put the mixture into a basin, season with pepper, salt, and a little lemon-juice, and stir in the yolk of an egg. Whip the white of egg to a stiff froth and mix it in lightly at the last. Pour the mixture into a well-greased cup or basin, filling it not more than three parts, and cover it with greased paper. Steam slowly for about 15 minutes, or until the soufflé feels firm to the touch. Then turn out carefully on to a hot plate and garnish with parsley. Serve with brown bread and butter or dry toast.

A Fish Cream

This may be made in the same way as the above soufflé by adding 2 tablespoonfuls of whipped cream to the fish and bread-crumb mixture instead of the egg.

Fish and Bread Sauce

Ingredients.—½ lb. filleted fish, ½ tea-cupful milk, 1 des.-sp. butter, 1 tab.-sp. bread-crumbs, 1 tea-sp. chopped parsley, seasoning.

Method.—Wipe the fish and make little rolls of the fillets or cut them in pieces. Put them in a lined or earthenware saucepan with the milk, butter, and seasoning, and cook them slowly until tender. Then lift out the fish, arrange the pieces neatly on a plate, and keep them hot. Add the bread-crumbs to the liquid in the saucepan and stir over the fire until they swell and thicken. A little more milk or a tablespoonful of cream may be added if necessary. Sprinkle in the parsley, cook it a minute, and then pour this sauce over the fish. Garnish with cut lemon, and serve plain bread or a dry rusk separately.

Baked Fillets of Fish

Cut a small filleted fish in neat pieces and season with white pepper, salt, and a little lemon-juice. Grease a small fire-proof dish and sprinkle it with fine bread-crumbs, chopped parsley, and a little grated lemon-rind. Lay the pieces of fish on the top of this and cover with more bread-crumbs, &c. Pour 1 or 2 tablespoonfuls of milk round, place some small pieces of butter on the top and bake in a moderate oven about 15 minutes. Serve in the same dish, wiping first round the edges, and garnish with a little parsley.

MEAT

In the order of digestibility chicken perhaps comes first, and the white meat from the breast and wings is more tender than the legs. Pheasant, partridge, grouse, and woodcock are also light and digestible, and form a nice variety when they are in season. They should not be high. Young pigeon is also suitable, but not ducks and geese, as they are too fat. Rabbit is not of very much value in the sick-room, but if young and carefully cooked it may be given as a change now and then.

After game and poultry, mutton is generally given before beef, and young meat, such as veal and lamb, are considered less wholesome. Pork and salted meats should never be given to an invalid with the exception of bacon, which, if lightly toasted or well steamed or boiled, supplies a very wholesome form of fat. Tripe and sweetbread are also light and delicate, and calf's brains may be given if liked, but the other internal meats, such as liver, heart, and kidneys should be avoided. Calf's feet and calf's head are other wholesome dishes, and easily digested if well cooked.

Game and all white meats require thorough cooking, but mutton and beef are often more digestible if underdone.

Grilling, steaming, roasting, and boiling are among the simplest methods of cooking meat, but frying and most forms of stewing are too rich for sick-room use.

A Grilled Chop

A chop from the loin or best end of the neck is best, and it should be cut not less than ¾ inch thick. First see that the fire is clear and bright, and if smoky sprinkle a little salt over it. Then wipe the chop, trim off the skin and most of the fat, and brush it over on both sides with a little butter. Heat the gridiron, and grease it also with butter or a small piece of the mutton fat. Place the chop on it and cook in front of or over the fire, turning it every few seconds. The time will depend on the thickness of the meat and upon whether the chop is wished well or underdone. It must be nicely browned on both sides, and from 6 to 8 minutes is generally sufficient to cook it. When ready place the chop on a very hot plate and serve at once.

Note.—A piece of steak from the rump or fillet may be cooked in the same way.

Chicken "en Casserole"

Ingredients.—½ chicken, 1 cupful water or clear broth, 1 stick celery, 1 tea-sp. cornflour or arrowroot, 1 yolk of egg, seasoning.

Method.—Cut the chicken in small joints, removing as much of the skin as possible. Put the pieces into an earthenware casserole and pour in the water or veal or chicken broth. Add salt to taste and the celery cut in fine shreds. Cover closely and cook slowly in the oven or by the side of the fire until the chicken is tender, from 1 to 1½ hours. When ready lift out the pieces of meat and add the arrowroot or cornflour, broken with a little cold water, to the liquid in the casserole. Stir until boiling and boil 2 or 3 minutes. Then draw to one side and stir in the yolk of egg. Return the pieces of chicken and let them reheat thoroughly, but do not boil again. A little chopped parsley and cream may be added if liked. Serve in the casserole.

Chicken Cream or Soufflé

These may be made in the same way as Fish Cream or Fish Soufflé given above, by substituting the raw breast of chicken for the fish.

Panada of Chicken

Ingredients.—The breast of a small chicken, 1 des.-sp. cold water, 2 tab.-sps. cream, a pinch of salt, and a squeeze of lemon-juice.

Method.—Use the flesh only from the breast, wipe it, and cut it in small pieces. Put it into a small basin with the water and salt, cover, and steam until tender. Then pound the contents of the basin in a mortar and rub them through a wire sieve. Add the cream and lemon-juice and reheat in a small saucepan. Serve in a dainty dish or scallop shell with dry toast or a rusk. Or, if preferred, the panada may be served cold.

Note.—Veal or game may be used instead of the chicken. This is a very delicate and nourishing preparation.

Sweetbreads Cooked in Milk

Ingredients.—1 calf's sweetbread, 1 cupful milk, 1 tea-sp. cornflour, 1 or 2 tab.-sps. cream, 1 tea-sp. chopped parsley, seasoning.

Method.—Choose a very fresh heart sweetbread and soak it in cold water for an hour. Then place it in a saucepan with fresh cold water to cover it, bring to the boil and throw the water away. Rinse the sweetbread again in cold water, pull off all skin and fat, and break it into small pieces. Put these into a lined or earthenware saucepan with the milk and seasoning to taste, cover, and cook slowly until tender, from 1 to 1½ hours. Then lift out the pieces of sweetbread and add the cornflour, mixed with a little cold milk or water, to the milk in the saucepan. Stir until boiling, add the cream and parsley, and return the sweetbread to reheat. Serve garnished with a few sippets of toast.

Note.—The yolk of an egg may be added instead of the cream, but the sauce must not boil afterwards.

A FEW USEFUL PUDDINGS

Puddings and other sweets for an invalid must be as light and delicate in flavour as possible.

If made of a farinaceous substance, such as rice, barley, sago, &c., it is most important that this be well cooked, and the mixture must on no account be solid in texture. If an egg is added the white should be beaten up separately from the yolk, as this introduces air into the pudding and makes it lighter.

Care too must be taken in the amount of sugar and kind of flavouring added. It is always safer to under-sweeten, and the flavouring must be of the very simplest, such as lemon or orange rind, bay-leaf, nutmeg, cinnamon, or a small piece of vanilla pod.

If a pudding has been baked in the oven see that the dish is wiped clean before serving it.

Jellies are always refreshing, and are generally acceptable to invalids. Although not in themselves nourishing, they are often a means of giving stimulant and other restoratives. They must never be stiff, but should melt away in the mouth without requiring any mastication. Use isinglass or the finest gelatine for stiffening purposes.

Semolina Soufflé

Ingredients.—1 des.-sp. semolina, 1 breakfast-cupful of milk, 1 egg, 1 tea-sp. sugar, grated orange rind.

Method.—Put the semolina and milk into a lined saucepan with a little grated orange rind or other flavouring, and stir over the fire until boiling. Then cook slowly from 10 to 15 minutes until the semolina swells and thickens the milk. Remove the saucepan from the fire, stir in the sugar and yolk of egg, and lastly the white beaten to a stiff froth. Pour this mixture into a buttered soufflé dish or pie-dish and bake in a moderate oven until nicely browned and well risen. Sprinkle with sugar and serve at once. A little cold milk or cream and stewed fruit may be served separately.

Note.—Ground rice or fine sago may be used instead of semolina, and the soufflé may be steamed instead of baked.

Cup Custard

Ingredients.—1 egg, ½ tea-cupful milk, 1 tea-sp. sugar, grated lemon rind.

Method.—Beat up the egg with the sugar and a very little grated lemon rind, or any other flavouring preferred. Add the milk and strain all into a small cup or basin. Cover with greased paper and steam very slowly until set. Turn out carefully and serve plain or with a little cream.

Notes.—This little pudding may be varied by adding to it a few biscuits or sponge-cake crumbs, or by putting a little stewed apple, or even a stewed fig cut in small pieces, at the foot of the basin before pouring in the custard. Or, again, a little strong, clear coffee, or a teaspoonful of brandy or liqueur may be mixed with the milk to give flavour.

Stewed Prunes

Ingredients.—½ lb. prunes, 2 or 3 oz. sugar, cold water, rind and juice of ½ lemon.

Method.—Wash the prunes carefully and soak them for a few hours, or overnight if possible, with the cold water, sugar, and the thinly-peeled rind of ½ lemon. Then turn the prunes into a lined saucepan with the liquid, put the lid on the pan, and stew very slowly for 20 minutes, or until they are tender.

Notes.—If preferred the prunes may be steamed in a jar, but they will require longer time. Other flavourings may be used, such as cinnamon stick, orange rind and juice, or a little red wine.

Cream Blancmange

Ingredients.—1 gill milk, 1 gill cream, ¼ oz. isinglass, 1 tea-sp. sugar, flavouring.

Method.—Put the milk and isinglass into a small lined saucepan with a little flavouring, such as a bay-leaf or a small piece of vanilla pod. Cover and stand this by the side of the fire until the milk is flavoured and the isinglass dissolved. Then strain into a basin, mix in the cream, and sweeten to taste. Stir the mixture occasionally until almost cold, pour into a small wetted mould, and put into a cool place to set. When required, turn out and serve plain or with a little fruit jelly.

Orange Jelly

Ingredients.—3 oranges, 1 lemon, ½ oz. gelatine, 2 oz. sugar, 1½ gills cold water.

Method.—Wipe the lemon and one of the oranges and peel the outside yellow rind off them very thinly. Put this into a lined saucepan with the water, gelatine, and sugar, and stir over the fire until the gelatine is melted. Then simmer slowly from 10 to 15 minutes to extract the flavour from the rind, and strain into a basin. Add to this the strained juice of the oranges and lemon, mix well, and put in a cool place to set.

This is not a clear jelly, but it is easily made and is very refreshing. A little cream may be served with it.

Junket

Ingredients.—½ pt. new milk, 1 tea-sp. prepared rennet, 1 tea-sp. sugar, a pinch of salt, 1 tea-sp. brandy.

Method.—Make the milk lukewarm and pour it into a glass or china dish. Add to it the salt, sugar, brandy and rennet, and mix with a spoon. Then let it stand until firm. If liked, a little grated nutmeg or cinnamon may be sprinkled over the top, or one or two powdered ratafia biscuits. Serve with cream. This is a very pleasant form of taking milk, and makes a nice variety when an invalid is on milk diet.

INVALID DRINKS

Gruel

Ingredients.—1 des.-sp. fine oatmeal, ½ pt. milk, salt or sugar to taste.

Method.—Mix the oatmeal smoothly with a little of the milk and heat the remainder of the milk in a saucepan. Add the oatmeal to the hot milk and stir over the fire until boiling. Cook slowly for 15 minutes, stirring occasionally, and if it becomes too thick add a little more milk. Add salt or sugar to taste, then strain and serve very hot.

Notes.—Water may be used instead of milk, and a tablespoonful of cream or a small piece of butter may be stirred in just before serving. A little brandy or rum is sometimes added. Barley meal may be used instead of oatmeal; it is very nourishing, and makes a nice change.

Barley Water

Ingredients.—1 tab.-sp. pearl barley, 1 pt. cold water, juice of ½ lemon, sugar to taste.

Method.—Wash the barley; put it into a lined saucepan and cover with cold water. Boil this a few minutes, then strain and rinse the barley with fresh cold water. This will whiten it and prevent the drink having a muddy appearance. Now return the barley to the saucepan with the pint of cold water, and cook slowly from 1½ to 2 hours, adding more water if necessary. Strain off the liquid, add sugar to taste, and if liked the strained juice of ½ lemon. Serve either hot or cold.

Notes.—Barley water will not keep long; it should be made fresh every day. It is frequently mixed with milk; in this case no lemon-juice should be added. It is a very light and nourishing drink, and is good for quenching thirst.

Rice Water

Make this in the same way as Barley Water, but allow a shorter time for cooking. A small piece of cinnamon stick is often used for flavouring. A little brandy or wine may be mixed with the rice water if stimulant is required.

Egg Drinks

There are many different ways of making these, of which the following are a few examples. In all cases the eggs used must be of the very freshest, and the thread or speck must be removed.

(1) Beat up an egg with a tablespoonful of sherry or 1 dessert-spoonful of brandy and 1 teaspoonful of sugar, without making them too frothy. Add a tea-cupful of hot milk and strain into a tumbler. The white of egg may be omitted.

(2) Beat up the white of an egg to a white froth, but not too stiff. Put it into a tumbler and pour a cupful of hot milk gradually on to it, stirring all the time. A little sugar or a pinch of salt may be added if wished.

(3) Beat up the white of an egg to a stiffish froth and put it into a tumbler. Add 1 or 2 tablespoonfuls of cream and 1 tablespoonful of brandy or wine. Mix all together and serve. Sugar may be added if wished.

(4) Beat up the yolk of an egg with a teaspoonful of sugar and 2 tablespoonfuls of milk or cream. Put this into a tumbler and fill up with soda or potash water.

Lemonade

Ingredients.—2 fresh lemons, 1 pt. boiling water, a little sugar.

Method.—Wipe the lemons and peel the yellow rind off them as thinly as possible. Put this into a jug, strain in the lemon-juice, add the sugar, and pour the boiling water over all. Cover and stand until cold. Then strain off as required.

Notes.—The lemonade may be made with less water, and soda or potash water added before serving; or rice or barley water may be used. Another nice drink is made by adding ½ glass of sherry and 1 egg to ½ tumblerful of lemonade; whisk all together, strain, and serve. Orangeade may be made in the same way, or an orange and a lemon together make a nice combination.

Whey Drinks

In these drinks the curd, which is the heaviest part of the milk, is strained out, and the whey, or watery part, only is served. They are very light and easily digested.

(1) Heat ½ pint of milk to a lukewarm temperature and add to it 1 teaspoonful of prepared rennet. Leave this to stand in a warm place until a curd is formed. Then break it up, strain through muslin, and the liquid is ready to serve.

(2) Put a tea-cupful of milk into a saucepan and bring it to the boil, add ½ glass of sherry and sugar to taste. Keep this over the fire until it curdles, then strain through muslin.

(3) Make in the same way as No. 2, using 1 tablespoonful of lemon-juice instead of the wine.

A little cream may be added to any of these whey drinks after straining.

PEPTONISED FOODS

Peptonised foods are of the utmost value in cases where the digestion is so weak that milk and other foods cannot be taken in their ordinary form. They should only be given under medical orders, and when it is necessary to give the digestive organs rest for the time being.

During the process of peptonisation the foods are digested or partly digested by means of a ferment. This ferment, or peptonising agent, can be obtained either in liquid or in powder form, and full directions for use are given with each preparation. The following simple recipes in which liquor pancreaticus is used will help to illustrate the general principles of the process.

Peptonised Milk

Proportions.—1 pt. new milk, 1 gill water, 2 tea-sps. liquor pancreaticus, 20 grs. or ½ level tea-sp. bi-carbonate of soda.

Method.—Put the milk and water into a saucepan and heat them to 140° Fahr., or, if no thermometer is at hand, bring half the quantity of liquid to the boil and add to it the other half cold. Pour the liquid into a jug and add the soda and liquor pancreaticus. Cover to keep out the dust, and stand in a warm place or under a cosy near the fire for ½ to 1 hour, according to the degree of pre-digestion required. As the process of peptonisation goes on a slight bitterness is developed, which is objectionable to some palates, but a few trials will indicate the limit most acceptable to the individual invalid. As soon as this is reached, the milk must either be taken at once or boiled up to prevent the further action of the ferment. It will then keep like ordinary milk.

Peptonised milk may be mixed with equal parts soda, Vichy, or other carbonated water, and a little crushed ice may be added.

Peptonised Milk Gruel

Proportions.—½ pt. thick gruel, ½ pt. new milk, 2 tea-sps. liquor pancreaticus, 20 grs. bi-carbonate of soda.

Method.—Prepare some water gruel as directed on p. 667. It must be well boiled and very thick. Add to the gruel while still boiling hot an equal quantity of cold milk. The mixture will then be of the required temperature. Add the liquor pancreaticus and soda in the above proportions, cover, and set in a warm place about 1 hour, or until a slight bitterness is perceptible. Then boil for a few minutes and strain.

Note.—The gruel need not necessarily be made of oatmeal; it may be prepared from any of the numerous farinaceous articles in common use—such as arrowroot, sago, barley, semolina, pea or lentil flour, &c. Whichever is used must be thoroughly cooked.

Peptonised Beef-Tea

Proportions.—½ lb. lean juicy beef, 1 pt. cold water, 1 table-sp. liquor pancreaticus, 20 grs. bi-carbonate of soda.

Method.—Shred down the meat finely (see p. 663), and put it into a lined saucepan with the water and soda. Heat gradually, stirring all the time, and then simmer *very* slowly at least ½ hour. Then pour into a jug and cool down to a lukewarm temperature, not exceeding 140° Fahr. Add to it the liquor pancreaticus in the above proportions, and stir it well in. Cover the jug and keep warm 1 hour or longer, stirring occasionally. At the end of this time bring the beef-tea to the boil, and strain off the liquid part ready for use.

Peptonised Beef-Tea Jelly

Proportions.—½ pt. peptonised beef tea, ½ oz. French sheet gelatine or ¼ oz. isinglass.

Method.—The beef-tea must first be boiled to stop the peptonising process, otherwise the ferment would act on the gelatine and destroy its stiffening property. Put the beef-tea into a saucepan with the above proportion of gelatine or isinglass and stir over the fire until dissolved. Then strain into a small mould or basin that has been rinsed out with cold water, and keep in a cool place, or on ice, until set. Then turn out and serve cold.

FLORENCE B. JACK.

THE HEALTH LIBRARY

In former days the Medical Library had no place in the household. Religious people were accustomed to supplement the knowledge they acquired from the clergyman's sermon by reading volumes of discourses and prayers. But our forefathers seldom read books on Medicine: they were not content to leave their souls entirely in the care of the village parson, but, strangely enough, they left the care of their bodies entirely to the village doctor.

Occasionally a "Doctor's Book" stood on the shelf, and at times of trouble it would be consulted eagerly. But as a general rule the old-fashioned "Doctor's Book" did more harm than good. The previous generation was badly informed on matters pertaining to health and disease. As a result, the man who wanted to know how he should treat a cold in the head would discover that he was in the first stages of consumption, pneumonia, or some other dire disease. A "little knowledge" is never so dangerous as when it is a little knowledge of medicine.

Most of us have read Mr. Jerome K. Jerome's delightfully humorous account of how he went into a library to look up some trifling ailment from which he was suffering. He found the information he required, and, in an idle moment, began to read the symptoms of some terrible disease. He was alarmed to find that he had every symptom. He turned to another disease, and found that he had suffered from it from childhood. So he began at the letter A and read up every disease to letter Z. He found that he had every one except Housemaid's Knee!

Mr. Jerome's humorous sketch is scarcely an exaggeration. Most of us have at one time or another gone to a medical book for advice and have concluded in great fear that the slight pain in the right side was the first sign of an attack of acute pneumonia.

The book on medicine is positively dangerous when placed in the hands of neurotic or hypochondriac people. Medical students invariably pass through a stage when they imagine they have every disease known to the faculty. And this stage generally comes at a time when the student is worried and overworked.

What the public requires is books on Health, rather than books on Disease. It is much more important that a youth should know how to prevent consumption than how to cure consumption.

Now that our educational authorities are recognising the immense importance of Hygiene as a necessary subject in the school curriculum, the Medical Library will have a place in every household. School managers might do more than they are doing at present to further medical education. Nearly every elementary school has its school library, but not many school libraries have a Health Book shelf.

In purchasing medical books the layman meets with a difficulty. The title of a medical work may be simple: the householder may buy it only to find that it is technical in language, and understandable to medical practitioners and students only. Obviously many books are written by specialists for specialists. A physician invents a new theory about intestinal disorders: he forthwith sits down and writes a book on the subject. A surgeon discovers that such and such a disease lends itself to surgical treatment: he at once publishes an exhaustive account of his operations. Such books are beyond the scope of the layman.

The man who is forming a Medical Library will be well advised to examine a book carefully before buying it.

Most of the works recommended below are simple to read: as a general rule we have indicated the books that are intended for the advanced student. A selection of the books would be a very prudent investment for any householder.

General Works.—The beginner will find much useful information regarding Medicine and Surgery and their recent developments in *Medical Science of To-day*, by W. Evans, a little book that appeals to the man without a medical education.

Another good work for the beginner is *The Laws of Life and Health*, by Alexander Bryce, M.D., a book addressed to the layman, telling him of the conditions that produce soundness of body and mind.

Anatomy and Physiology.—The average book on Anatomy is for the student of medicine. Books like Cunningham's *Anatomy* or Morris's *Treatise of Human Anatomy* are too technical for the ordinary reader.

But the subject of Physiology is treated in popular fashion by many writers. One of the best works for the layman is Leonard Hill's *Manual of Human Physiology*, which claims to be for the man of no scientific training. It practically abolishes technical terms. The same author also writes a small *Physiology for Beginners*, which is intended for medical students, but is quite easily read by layfolk.

There are two elementary text-books that can be recommended—Benjamin Moore's *Elementary Physiology* and Schofield's *Physiology for Schools*. Each forms an excellent introduction to the subject.

The Body at Work, by Alexander Hill, is a stout volume for non-scientific people. It is exhaustive, and is written in simple language.

An American work, *Anatomy and Physiology for Nurses*, by Diana Clifford Kimber, is compiled from the writings of famous specialists. It is a good book, but a little too advanced for the ordinary reader.

Hygiene, &c.—The parents who are not content to rear their family in a haphazard "trust-to-luck-and-the-doctor" fashion, will desire to read books that deal with home hygiene, the milk supply, food and its adulteration, and similar subjects. The average book on the Home is concerned with the artistic rather than the hygienic side of the question. But books like Percy Dearmer's *Garden Cities* treat of both sides.

Laurence Weaver's *The House and its Equipment* is a well-got-up book that gives precedence to art in the home, but the second part contains much practical advice about heating, lighting, sewerage, &c.

Another excellent work is Spencer Sills' *Common Sense Houses* (1912). It contains chapters on the structure of the house, water supply, drains, dust and refuse, light and air, warming the home, lighting, &c., and many illustrations help to make the book attractive.

Air and Health, by Ronald C. Macfie, gives a detailed account of how the atmosphere is corrupted, and contains many wise things about smoke, fog, offensive gases, dust as a harbour for organisms. The writer's remarks on ventilation are sound.

Health for the Million, by Alfred B. Olsen, M.D., and M. Ellsworth Olsen, M.A., is a book for the layman. The authors write about the deleterious effect of city life with its overcrowding, and eulogise the Garden City movement. They also dilate at length upon personal hygiene, and even go so far as to discuss Love and Marriage, and advocate lovers being compelled to show a certificate of health before marriage.

Most books on hygiene are primarily intended for the medical student or the nurse, but many are easily understood by the layman.

For instance, *The Elements of Hygiene and Sanitation*, by Hough and Sedgwick, is a very readable book. It divides itself into three sections. The first section is concerned with muscular activity, the hygiene of the nervous system, the hygiene of feeding. Drugs, alcohol, tobacco, clothing, &c., are all included in this section.

The second section is devoted to domestic hygiene and sanitation, and deals freely with the lighting and warming of the dwelling-house, the regulation of the air and water supplies, the disposal of sewage.

The third and last section, dealing with public hygiene and sanitation, is primarily for the Medical Officer of Health.

Another work intended for students is D. H. Bergey's *The Principles of Hygiene*, but the style and language are popular. Besides the usual chapter on air, water, ventilation, &c., the book contains very helpful articles on Industrial Hygiene, School Hygiene, Habitation, Vital Causes of Disease.

There is much information in *The Earth in Relation to the Preservation and Destruction of Contagia*, by George Vivian Poore, a book which enters scientifically into the part played by the earth in preserving and destroying organisms and in polluting and protecting water supplies. The chapter on "Milk in relation to Health and Disease" is good. The same author writes a book entitled *Essays on Rural Hygiene*, which describes various experiments in rural sanitation.

John F. J. Sykes is the author of *Public Health and Housing* (Milroy Lectures), a work full of information and suggestion.

Other trustworthy books are *Manual of Hygiene*, by John Glaister, a book for students and nurses; *Hygiene and Public Health*, by Sir A. Whitelegge and Sir G. Newman, a standard work for Medical Officers of Health and Medical Inspectors of Schools. *Practical Sanitation*, by George Reid, much used by sanitary inspectors; *A Handbook of Hygiene*, by A. M. Davies, a book containing, in comparatively small compass, all that is worth knowing about hygiene.

Two interesting books are H. Jephson's *The Sanitary Evolution of London*, a work based on reports of Sanitary Inspectors and Medical Officers of Health; and W. Nicholson's *Practical Smoke Prevention*, which deals with smoke-preventing appliances, &c. The latter is more of an economic than a medical treatise.

The Principles and Methods of Physical Education and Hygiene, by W. P. Welpton, B.Sc., the Master of Method of Leeds University, is one of the University Tutorial series of text-books. It is an exhaustive treatise, written simply and clearly, and is invaluable to teacher and parent alike.

Food.—Books relating to Food are generally for the Food Inspector, but they are all of interest to the householder.

A well-known work is *Food Inspection*, by H. A. MacEwan, a writer who has studied his subject in Britain, America, and Germany. This author also writes *The Public Milk Supply*, in which he discusses the relation existing between milk and public health, the proper housing of animals, the correct method of treating dairy products.

Foods and their Adulteration, by Harvey W. Wiley, is a standard work. This is a handsome volume with many illustrations. It describes the origin, characteristics, and manufacture of familiar foods. The author gives minute hints for the detection of adulteration, and refers to the food supply as it affects economics.

Meat and its Inspection, by Arthur R. Littlejohn, is a book for Meat Inspectors and Medical Officers of Health.

Food Adulteration and its Detection, by Jesse P. Battershall, an American writer, is also technical but easily readable.

The milk supply is well treated in W. G. Savage's *Milk and the Public Health*, a book divided into three sections. The first summarises what is known of bacterial contamination of milk; the second describes bacteriological examination of milk specimens; the third and last part dwells upon the administrative side of the milk question.

Rural Hygiene, by Isaac W. Brewer, M.D., is sound on the subject of milk and its dangers. He draws special attention to the cow as a promoter of tuberculosis, and gives illustrations of two apparently healthy cows which were found to be suffering from tuberculosis.

Health of Children.—*Our Baby* has been written by Ralph Oakley Clark, M.D., with the object of teaching young mothers how to bring up their children in such a way that they will be strong and healthy. The author shows what sort of food is best for the child at different ages, how much should be given, how it should be prepared, and when the child should be fed. He allots special chapters to the child's bath, its clothes, the amount of sleep required, and the time of putting to bed, the training and exercise of the child, and its weight. The common ailments of infancy and the home treatment of them are described, but the more serious disorders are omitted, as the writer believes that these ought to be left to the physician.

The mother is told how to recognise the signs of illness in an infant. This is important, because the little sufferer cannot describe his symptoms, and the observer has to get what information he can from the child's appearance, his cry, and his movements.

The treatment of cases of emergency is described, and the author finishes by saying a few words on the choice of a nursemaid.

In *Diet and Hygiene for Infants*, the author, F. Herbert Alderson, M.B., deals only with infants up to the age of one year. The book, which is intended as a guide to mothers and nurses, frankly confesses that its object is not to describe the disorders of childhood, but to show the guardians of the infant how to rear it properly. The part which deals with feeding does so in an interesting manner.

The various ways of preparing the baby's food are fully described, and mention is made of some of the better-known patent foods. The author deals thoroughly with the teething of children, and protests strongly against the use of the "dummy" teat.

Charles West, M.D., in his book, *How to Nurse Sick Children*, gives a good deal of sound advice. He explains the signs of illness in children, and tells how they may be detected. He describes the rashes of the fevers which are common in childhood, and treats of the usual diseases of children. The book contains a special article on the sick child's room.

Children: Their Care and Management, by E. M. Brockbank, M.D., F.R.C.P., is a book which gives much good advice about babies. It treats of their feeding, nursing, sleep, &c., in a way that will appeal to mothers.

Dr. A. Dingwall Fordyce has written a small book about children. It is called *The Care of Infants and Young Children*, and although it is primarily intended for the medical profession, it is written in such a way that it can be easily understood by the lay public. The same writer is the author of a larger treatise, viz., *The Hygiene of Infancy and Childhood*, which deals more thoroughly with the subject.

Other books that can be recommended are *Children in Health and Disease*, by Dr. D. Forsyth, in which special attention is paid to the psychology of the child, schools, the care of feeble-minded children, and infant mortality; *The Care and Management of Delicate Children*, by Percy Lewis; *On the Natural and Artificial Methods of Feeding Infants and Young Children*, by Edmund Cautley, M.D.; and *Your Child's Health*, by John Grimshaw, M.D., B.S. (London).

Sex and Motherhood.—There are several books which aim at explaining the mysteries of sex to boys and girls. The following can be recommended:—*Confidential Chats with Boys*, and *Confidential Chats with Girls*, by Wm. Lee Howard, M.D.; *What a Mother should tell her little girl, what a Father should tell his little boy, what a Mother should tell her daughter*, and *What a Father should tell his Son*, all written by Isabelle Thomson Smart, M.D. The explanation is made simple and interesting by an analogy on the procreation of flowers and the lower animals. It is obvious that a discussion of the hen's egg leads naturally to an understanding of sex in the higher animals.

Confidential Talks with Young Men, and *Confidential Talks with Young Women*, both by Lyman B. Sperry, M.D., explain the various changes that take place in young people at puberty.

Woman in Girlhood, Wifehood, and Motherhood, by M. S. Cohen, treats of matters pertaining to woman from the time she is arriving at puberty until the climacteric period is reached.

The book begins with a short article on the basis of beauty in which is pointed out the dependence of beauty on perfect health. Bathing, the care of the teeth, hair, nails, and skin, exercise, and hygienic clothing are fully dealt with, and special notice is taken of deformities of the figure, many of which are caused by too much stooping over desks. The author explains the anatomy and physiology of the female, and then deals with the period of puberty, "the passing from girlhood to womanhood."

He writes in a homely fashion on Courtship, and Marriage, Heredity, and Consanguinity. The life of a woman during pregnancy and her confinement are touched upon.

The care of the baby receives attention, and the common ailments it is liable to suffer from are not neglected. There is an article on woman at the climacteric period, and another on the diseases peculiar to the female sex.

The duties and responsibilities of married life are discussed in *The Wife and Mother*, by Albert Westland. Mention is made of the altered conditions of life after marriage, and the subject of Pregnancy is dealt with fully and capably.

Another book of the same kind is *The Prospective Mother*, by J. Morris Slemons. It gives sound advice on the safeguarding of the health of women. Food requirements during pregnancy, the care of the body, and general hygienic measures are well treated.

Other subjects dealt with are ailments of pregnancy, miscarriages, preparation for confinement, lying-in period, and the nursing mother.

Dr. Helen Y. Campbell has written a book which can be thoroughly recommended to married women. The title of it is *Practical Motherhood*. Amongst the subjects which are discussed are pregnancy, preparation for the baby, infant management, breast feeding, patent foods, bottle feeding, feeding after the first year, diseases and home treatment, and first aid in the nursery. The development and training of the mind in children, the care of school-children, puberty, and sex training receive special attention. At the end of the book many excellent recipes for ordinary and invalid diet are given.

Conjugal Hygiene.—The subject of conjugal hygiene has a literature of its own, and young married people and those about to marry will be well advised to make themselves acquainted with the works of men who have studied the subject scientifically.

The Ethics of Marriage, by H. S. Pomeroy, M.D., treats the subject fully and carefully.

On Conjugal Happiness, by Loewenfeld, translated by R. G. S. Krohn, M.D., is a well-known book. It treats the subject quite as much from the point of view of the psychologist as from that of the medical man. A characteristic of this work is its sane attitude towards sex matters; the author makes it clear that he is treating the subject solely in the interests of hygiene.

Sylvanus Stall, D.D., has written four very popular treatises on matters sexual. These are: *What a Young Boy Ought to Know*, *What a Young Man Ought to Know*, *What a Young Husband Ought to Know*, and *What a Man of Forty-five Ought to Know*. Companion books in the same series are *What a Young Girl Ought to Know*, *What a Young Woman Ought to Know*, *What a Young Wife Ought to Know*, and *What a Woman of Forty-five Ought to Know*. The authors of the latter are Mrs. Mary Wood-Allen, M.D., and Mrs. Emma F. A. Drake, M.D.

Diseases of Occupation.—A most important branch of medicine is that dealing with environment and occupation as they affect health.

Perhaps the best known work on this subject is Sir Thomas Oliver's *Diseases of Occupation*, a book written from the legislative, social, and medical points of view. It treats factory legislation at length, and is specially valuable in its treatment of woman's work, diseases due to impure air in the working-room, working in compressed air, parasites and micro-organisms, electrical shock, work in high temperatures.

L. A. Parry's *The Risks and Dangers of Various Occupations and their Prevention*, is a good book, written for the employer and employee. It has chapters on dust, metallic poisoning, chemical trades, miscellaneous trades, poisonous vapours, general hygienic considerations.

An exhaustive treatise is *Industrial Poisoning*, by Rambousek, translated by Thomas M. Legge, M.D., D.P.H. It is divided into three sections. The first describes industries and processes attended with risk of poisoning. The second is devoted to pathology and treatment of industrial poisoning, while the third deals with preventive measures.

Industrial Diseases and Accidents, by W. J. Greer, F.R.C.S., D.P.H.I., is a handy little book, having its articles arranged in alphabetical order.

Alcoholism and the Drug Habit.—In no other medical subject are good authoritative books of more importance than in the subject of Alcoholism. Many a heart-broken wife, in despair over her drunken husband, rushes to advertisements that offer "Drink cures," and her hard-earned shillings are expended on rubbishy powders, which she is led to believe will cure her husband if they are dropped surreptitiously into his morning coffee.

There are many books on the subject written by physicians of long experience. One of the most encouraging is J. W. Astley Cooper's *Pathological Inebriety*, which advocates the "combined method"—drugs and hypnosis.

Books well worth perusal are *Alcoholism*, a chapter in Social Pathology, by W. C. Sullivan, M.D.; *Alcoholism and Its Treatment*, with an examination of the so-called cures, by J. E. Usher, M.D.; *Alcoholism: A Study in Heredity*, by G. Archdall Reid, M.B., F.R.S.E.

C. A. M'Bride, M.D., writes for the laity and the medical profession a book called *The Modern Treatment of Alcoholism and Drug Narcotism*, which gives the author's experience of thirty years among alcoholic and drug inebriates.

On Alcoholism, by Francis Hare, M.D., is a suggestive little work.

The Drug Habit has a fairly extensive literature of its own. *Drugs and the Drug Habit*, by H. Sainsbury, is a standard work, but it is for the medical man rather than for the layman. The work is authoritative on the relation of medicaments to the disease, and it contends that drug habits "are but instances of a law which is fundamental, and in the manifestation of which temperament and education play primary parts."

An interesting work is S. Hillier's *Popular Drugs: Their Use and Abuse*, a little book that contains many useful hints about alcohol, tea, coffee, and other well-known stimulants.

Smokers will find H. H. Tidswell's *The Tobacco Habit: Its History and Pathology*, an entertaining book; the writer thinks smoking the most pernicious of all the drug habits.

Beauty and Physical Culture.—The subject of Personal Beauty is treated in books written by layfolk; the doctor does not as a rule consider that cosmetics come into his province. Yet although the faculty leaves our Beauty to Nature's care, we have a few treatises on the care of the uncovered parts of the body.

Professor Norman Walker's *An Introduction to Dermatology* is too technical for the lay reader, but another Edinburgh skin specialist, W. Allan Jamieson, M.D., F.R.C.P.E., writes a helpful little book on *The Care of the Skin in Health*.

The Care of the Skin and Hair, by W. A. Pusey, M.D., an American professor, is also a good little book.

There is a stout volume entitled *Beauty Culture*, by W. A. Woodbury. It is obviously a popular work; when the contents page of a book announces chapters on reducing fat, putting on fat, electrolysis—even hair-dyeing—we may be certain the book is of great interest to the average man.

There are many volumes on Physical Culture published, and quite a number are reliable. Sandow's *Body Building*, and his *Strength, and How to Obtain It*, enlarge upon the author's own system of culture, and give excellent charts of the various exercises.

The famous J. P. Müller writes a book entitled *My System*, translated into English by G. M. Fox-Davies.

Health in the Tropics.—To those who are interested in tropical hygiene Dr. W. J. R. Simpson's book, *The Principles of Hygiene as Applied to Tropical and Sub-tropical Climates*, will prove of great value. It is written in such a way that it can be readily understood by the lay public, and the photographs, which illustrate it, add greatly to its charm. In his preface the writer points out the way in which the hygiene of the Tropics differs from that of colder climates. He then goes on to deal with warm climates and personal hygiene, and draws attention to the lower mortality in such places as India, the West Coast of Africa, and the West Indies, since the removal of many insanitary conditions. The water supply, the purification of the water, the question of food, and the removal and disposal of sewage by various systems are treated in turn. The author dwells upon hygiene in relation to streets and houses, the soil and drainage, and communicable disease; and ends by giving a summary of preventive measures to be employed in some of the common infective diseases which are found in tropical countries.

The Prevention of Malaria is the work of Dr. Ronald Ross, and a number of eminent medical men who have studied the disease in some of the most unhealthy parts of the world. The book is written primarily for the medical profession, but Dr. Ross states in his preface that he has aimed at putting his subject in such a way that the general public will be able to understand it.

He commences by relating the history of the discovery of the malaria parasite, the fever which it causes, and the mode of infection. Many interesting facts about mosquitoes are given, and the subject of prevention fully dealt with. The preventive measures include various devices to guard against mosquito bites, the destruction of the larvæ, and the use of quinine.

The other contributors treat their subject admirably, and the book is well illustrated.

An excellent little book suitable for all readers is *Aids to Tropical Hygiene*, by Major R. J. Blackham, D.P.H., R.A.M.C. Amongst the subjects treated are the climate, air, and ventilation, water, food, clothing, and the disposal of refuse and of the dead. The section on animal parasites, insects, and disease, and the parasite of malaria is well written and of much interest.

Dr. T. Gerald Garry dwells upon the importance of animal parasites in the production of disease in the Tropics. He tells the reader the types of man and woman who are most suitable for service in hot climates, and pays special attention to the amount of food and drink that should be taken in the twenty-four hours.

Exercise and clothing have their share of treatment, and the author gives some modern views on the effects of Solar Rays. The title of the book is *Some Factors Influencing Health in Tropical and Sub-tropical Countries.*

Tropical Medicine, Hygiene, and Parasitology, by Gilbert E. Brooke, besides dealing with such things as climate, food, drainage, &c., treats of the hygiene of the mouth, and gives an excellent description of the animal and vegetable parasites which are such a source of trouble in tropical countries. Snake-bite and the bites of other venomous creatures receive special attention. There are many good illustrations.

A Sanitary Handbook for India, by the late Surgeon-Major C. J. McNally, M.D., is well worth reading. It deals with climate and meteorology, amongst other things, and describes the method of using meteorological instruments. The disposal of the dead, offensive trades, and common tropical diseases and their prevention are dwelt upon at some length.

A little book that should appeal to mothers who are living in warm countries is Dr. Lilian Austin Robinson's *The Health of Our Children in the Colonies.*

Eugenics.—Those interested in Eugenics will find that some knowledge of Darwinism and Evolution in general will help them to take a broad view of the subject. Bateson's *Mendel's Principles of Heredity* is the standard work on Mendelism, and Punnett's *Mendelism* is almost elementary, although exhaustive.

A good book for the beginner is *An Introduction to Eugenics*, by William and Catherine Whetham. Edgar Schuster's *Eugenics* (The Nation's Library) is also a good book to read for the main outlines of the subject.

Race Culture and Race Suicide, by Robert Reid Rentoul, M.D., is an entrancing work written in a strong, racy style. The author deals fully with heredity and environment as a cause of degeneracy.

Another very interesting book, written in a popular way, is Dr. George E. Dawson's *The Right of the Child to be Well-born.*

Albert Wilson, M.D., writes *Unfinished Man:* "a scientific analysis of the Psychopath or Human Degenerate." He gives many interesting facts about the work of the Salvation Army, Dr. Barnardo's Homes, &c., and writes forcibly and boldly. The writer has a theory of his own about the criminal, and the book is an argument in favour of this theory. The book's delightful aggressiveness makes it "read like a novel."

Readers who want to take up Eugenics in a scientific spirit cannot ignore such valuable books as Professor J. Arthur Thomson's *Heredity*, Weismann's *The Germ-Plasm*, L. Doncaster's *Heredity in the Light of Recent Research*, R. H. Lock's *Recent Progress in the Study of Variation, Heredity, and Evolution*, Herbert E. Walter's *Genetics: An Introduction to the Study of Heredity*, Davenport's *Heredity in Relation to Eugenics.*

The Mind's Influence on Health.—Hypnotism, as it relates to health, is of great importance, and the Medical Library should include the standard works on the subject at least.

The reader cannot do better than commence with *Hypnotism, its History, Practice and Theory*, by J. Milne Bramwell, M.B., C.M. This is an exhaustive work. It contains chapters on the history of science, methods of inducing and terminating hypnosis, and the causes which influence it, the experimental phenomena of Hypnosis, the stages of Hypnosis, Hypnotism in animals, in surgery, in medicine, the so-called dangers of Hypnotism.

Another standard work is *Treatment by Hypnotism and Suggestion*, by C. Lloyd Tuckey, M.D.

Hypnotism and Suggestion, by Bernard Hollander, M.D., besides showing how hypnotism affects disease, deals with the value of suggestion in moral education, and in curing the drink and drug habits. Special interest attaches to a chapter on auto-suggestion.

Hypnosis and Suggestion, by Hilger, translated into English by R. W. Felkin, M.D., F.R.S.E., is full of accounts of experiments, and makes most interesting reading.

Tuckey writes an introduction to *Hypnotism and*

Disease, by Hugh Crichton Miller, M.A., M.D. This book calls itself "A plea for rational psychotherapy," and recommends the "combined method"—*i.e.* Hypnosis aided by sedative drugs. It is a good treatise for beginners.

Everyone should read *The Hygiene of the Mind,* by Sir T. S. Clouston, late physician to Morningside Asylum, Edinburgh. Few books give so much valuable information in an elementary manner. The author writes chapters on food, education, heredity, social instincts, love-making, mind and morals and brain, hygiene of the emotions, psychic treatment of nervous diseases, hygiene of childhood, boyhood and girlhood, adolescence, manhood and womanhood, decadent period, special sex questions, mental hygiene of alcohol, tobacco, drugs, &c.

Religion and Medicine: The Moral Control of Nervous Disorders, by Elwood Worcester, D.D., Ph.D., Samuel M'Comb, M.A., D.D., Isador H. Coriat, M.D., is well known. It deals with the subconscious mind, suggestion and auto-suggestion, causes of nervousness, psychic and motor re-education, general principles of psychotherapy, abnormal fears, faith and prayer and their therapeutic value, the healing wonders of Christ, the outlook of the church, suicide and its prevention.

Other standard works are Bernheim's *Suggestive Therapeutics* (English translation by Christian A. Herter, M.D.); Forel's *Hypnotism, or Suggestion and Psychotherapy* (English translation by H. W. Armit, M.R.C.S., L.R.C.P., from the 5th (German) edition); Wetterstrand's *Hypnotism and its Application to Practical Medicine* (English translation by Henrik G. Petersen, M.D.); Percy Dearmer, *Body and Soul,* "an inquiry into the effects of religion upon health, with a description of Christian works of healing from the New Testament to the present day"; *Psychotherapeutics,* a symposium by Prince and other American professors and medical men.

Hydropathy.—R. O. Allsop, architect, is the author of two most interesting books on Hydropathy. *The Hydropathic Establishment and its Baths* deals with Vapour and Russian Baths, the Douche Room and its Appliances, Massage and Electrical Treatment, Pulverisation, and the Mont Doré Cure, Inhalation and Pine Cure, the Sun Bath.

The author's other work, *The Turkish Bath,* gives careful instructions as to adapting the Turkish Bath to the private house. It contains chapters on Heating and Ventilation, Water Fitting and Appliances, Lighting, Decorating and Furnishing, the Turkish Bath in the House, the Turkish Bath in Public and Private Institutions; it discusses even Turkish Baths for Horses.

Rational Hydrotherapy, by J. H. Kellogg, M.D., is an American work, valuable to the laity and the profession. It is exhaustive; every kind of bath and spray and douche is fully described and illustrated by photographs. An important part is that dealing with The Technique of Hydrotherapy, while Hydriatic Prescription-making is the heading of a long chapter on the treatment of various diseases. Owing to this book's size and thoroughness it may be too expensive for most readers.

Mineral Waters.—A standard work on Mineral Waters is *The Mineral Waters of Europe,* by C. R. C. Tichborne, LL.D., F.C.S., F.I.C., and Prosser James, M.D., M.R.C.P.(Lond.). It includes a description of Artificial Mineral Waters.

Massage.—One of the best-known works on massage is Ostrom's *Massage and the Original Swedish Movements,* lectures delivered at the Royal University, Upsala, on the treatment of various diseases. A great merit of the book is its excellent illustrations; indeed one could almost learn how to massage by studying the diagrams alone.

Another reliable work is Thomas Davey Luke's *Text-books of Massage and Swedish Gymnastics and other Exercises,* written chiefly for masseuses and nurses, but in popular language.

Lessons on Massage, by Margaret D. Palmer, is a standard work in Britain. It gives the history and theory of massage, and goes on to describe the general anatomy of the body. At the end of each description, *e.g.* the upper limb, the writer shows by diagram how treatment is given. There is a good chapter on bandaging.

Consumption.—Books on the treatment of Consumption are all very readable, for they deal with ventilation, clothing, food, and other topics of interest to the general reader.

A book that every home should possess is Noel D. Bardswell's *Advice to Consumptives.* The author, who is the Medical Superintendent of the King Edward VII Sanatorium, gives much encouraging information on home treatment and prevention.

A very suggestive book is *The Conquest of Consumption,* by Latham and Garland. It gives full particulars about sanatoria, &c., but its main argument is one in favour of State intervention. The authors suggest an annual expenditure of four and a half millions by the State.

Two larger works are well worth reading. Halliday G. Sutherland edits *The Control and Eradication of Tuberculosis,* a big volume of contributions from many specialists. The book describes at length the various well-known systems, and many photographs enhance its value. It is really a thesis advocating the "Edinburgh System," which favours the establishment of tuberculosis dispensaries in each district.

The other work, *Sanatoria for Consumptives,* by F. R. Walters, enters into such details as fees and situations of sanatoria. It gives exhaustive descriptions of all the well-known sanatoria.

First Aid.—*Before the Doctor Comes,* by Dr. Andrew Wilson, besides being a guide to first aid in cases of accident, tells the reader how to detect the oncoming of disease, and how to treat it until the arrival of the doctor. A brief outline of Anatomy and Physiology is given at the beginning of the book, and then the author dwells upon the signs of disease, home remedies in disease, and first aid in disease. The last chapter is taken up with first aid in accidents and emergencies.

D. Hastings Young, M.B., M.S., describes his book, *First Aid to the Sick,* as a work of reference for the home. It is intended to be a companion to a book dealing with first aid to the injured. The book is written in simple language, and technical terms have not been used. The commoner diseases are described, and their treatment indicated.

The Appendix gives hints on making poultices, fomentations, &c., and advises on the important subject of the sick-room.

The Immediate Care of the Injured, by Albert S. Morrow, M.D., should prove very useful to laymen who wish to know all about first aid. It is couched in simple language, and is exceptionally well illustrated.

Part I. is given up to a brief outline of Anatomy and Physiology; Part II. contains good advice on bandaging, practical remedies, and the preparation in the home for accidents and operations. Part III. deals with emergencies and accidents, and the transportation of the injured.

Prompt Aid to the Injured, by A. H. Doty, M.D., is meant to be of use in the home, in factories, mining districts, and in fact anywhere where accidents are likely to happen. It is a small book, and contains good illustrations.

Another small book is Dr. Bernard Myer's *Atlas of First Aid Treatment.* It contains a number of excellent coloured plates, and besides treating the usual accidents and emergencies it deals with dog-bites, snake-bites, insect-stings, fish-hook extraction, and how to act if the clothes catch fire. The book contains only forty-three pages, but each page is full of interest.

First Aid to the Injured and Sick, by Dr. F. J. Warwick and Dr. A. C. Tunstall, is a book that will repay study.

Nursing.—As a general rule, the text-book on Nursing is intended for the professional nurse, but what is good reading for the hospital nurse is good reading for the mother in the home. For instance, *Nursing: Its Principles and Practice,* by Isabel H. Robb, although it deals fully with hospital nursing, giving particulars about nurses' training over their three years, treats infectious cases and the nursing of children and infants in a way that appeals to the woman at home.

Practical Nursing, by Isla Stewart and Herbert E. Cuff—a hospital matron and a doctor—is an excellent book. It contains six chapters on surgical nursing and a special one on poisoning cases.

Isabel Macdonald's *Home Nursing* is a good little book which should be kept as a work of reference.

Laurence Humphry's *Manual of Nursing, Medical and Surgical,* a book which has reached its twentieth edition, is excellent in describing baths, poultices, bandaging, &c. The appendix gives recipes of food for invalids.

Dietetics.—The best work on diet is *Food and Dietetics,* by Robert Hutcheson, M.D.; it is scientific without being technical. Much space is given to patent and proprietary foods, and to dietetic systems and cures.

Alexander Bryce, M.D., author of the article on "Diet" included in this volume, writes a large work entitled *Modern Theories of Diet,* and although written primarily for the medical man, it is valuable to the ordinary reader.

Foods and Dietaries, by Sir R. W. Burnet, "a manual of Dietetics," has chapters which the general reader will find helpful, *e.g.* Alcoholism, Children, Prepared and Pre-digested Foods, Cookery for Invalids.

Sir Henry Thompson's *Food and Feeding,* a book that reached its twelfth edition in 1910, treats the subject from a medical and gastronomical point of view, but is full of homely hints for the housewife.

The Spirit of Cookery, by J. L. W. Thudichum, calls itself a "history, science, practice and ethical and medical import of culinary art." It is easily readable.

Other well-known books are Alexander Haig's *Diet and Food* (sixth edition), which deals with the effect of albuminous food in producing urea, &c., and advocates a non-flesh diet; Gautier's *Diet and Dietetics* (English translation by A. J. Rice-Oxley); Buttner's *A Fleshless Diet; A System of Diet and Dietetics,* edited by G. A. Sutherland, a symposium written by specialists and treating such topics as Patent and Proprietary Foods, Invalids' Dietary, Diet in Hot Climates, Diet of Infants and Children.

THE MEDICINE CHEST

The average man thinks of the term medicine chest in connection with ships. Every schoolboy knows that, in a novel dealing with the sea, the captain of a ship has a medicine chest, and when sickness is on board he acts the part of doctor and druggist combined.

The medicine chest in the home is almost unknown; most folks are easy in mind because they know the chemist's shop is fifty yards down the street.

A man does not reject the idea of a home library because there is a public library in the town. A housewife does not refuse to make pies on the plea that the neighbouring bakery will make them quite as well. In most things man's innate sense of personal property asserts itself. He likes to have his books, his bath, his flowers, his vegetables on the spot, but, for some reason or other, he does not think of having his medicines on the spot.

This apparently indifferent attitude towards medicines may be explained quite easily. Until recently the layman was woefully ignorant of all things pertaining to health, and he looked upon drugs as strange, dangerous commodities that must not be handled, save by an expert. The druggist who poured drops from a big jar into a tiny bottle appeared to be a kind of magician. Most of us, as we watched the magician, have thought of his great responsibilities: "If he should take down the wrong bottle by mistake," we have thought, and then hastily have put the disturbing thought away from us.

Fortunately, the growth of sane education in matters relating to health and disease has almost killed the stupid superstitions about drugs. Family men are beginning to consider the medicine chest a part of the house-furnishing quite as necessary as the pantry.

Is a medicine chest dangerous? It may be, just as a paraffin lamp may be dangerous. It is foolish to leave little children playing in a room with a lighted paraffin lamp resting on the table, and it is no less foolish and blameworthy to leave open a medicine chest containing poisonous drugs, or even to possess a medicine chest in which poisons are not clearly distinguished, say, by a red label. A medicine chest is the most harmless thing in the world if its owner has sufficient knowledge to use it.

Moreover, a medicine chest is almost a necessity for those who dwell or intend to dwell in the overseas dominions. Those who live in the Dominion of Canada or in Australia may be miles from the nearest doctor, and unless possessed of some rudimentary medical skill, and unless certain remedies and appliances are at hand, accidents or slight illnesses may leave a lasting effect, or even issue fatally.

Certain rules should obtain with regard to every medicine chest. *Every bottle should be labelled clearly. Every poisonous drug should have a distinctive label.* If a packet of boracic acid is mistaken for a packet of baking soda, the patient will not be very cheerful if he tries to relieve indigestion by swallowing boracic acid in water. The newspapers often report deaths caused by a patient's drinking from the wrong bottle.

The following list contains only drugs which can be safely used by the layman. Many others could have been suggested, *e.g.* laudanum, but it seems wiser to be on the safe side. Incidentally these drugs and appliances are so inexpensive as to be within the reach of all but the poorest.

DRUGS

A.B.C. Liniment.—This is a composition of the liniments of aconite, belladonna, and chloroform, and is a very useful remedy in cases of muscular pains. It should be well rubbed into the painful parts.

Acetic Acid is often employed to relieve a headache. A towel should be moistened with a little of the fluid and tied round the forehead.

Alum.—An excellent gargle for the throat can be made by dissolving 5 grains of alum in 2 tablespoonfuls of cold water. Alum is an astringent, and as such it is commonly employed in cases of sweating feet. A little should be dissolved in the water in which it is intended to bathe the feet.

Ammoniated Tincture of Quinine.—If taken as soon as signs of a commencing cold are noticeable, this tincture very often is successful in cutting short the affection. The dose for an adult is from ½ to 1 teaspoonful every four hours; for children 5 to 15 drops are sufficient.

Bicarbonate of Soda or Baking Soda.—This is to be found in most houses. It may be used in cases of scalding or burning, a handful being dissolved in the water with which the part is bathed. In poisoning by acids it can be given to neutralise the acid which has been swallowed, but it is not so good as the carbonate of magnesium, as it tends to produce too much gas in the stomach. A teaspoonful dissolved in a glass of water is often efficacious in relieving the pain of indigestion when it is caused by a superfluity of acid in the stomach.

Blaud's Pills.—These are generally very efficacious in cases of anæmia. One should be taken after each meal to begin with, increasing the dose to three thrice daily.

Blue Pills.—A blue pill at night and a Seidlitz powder in the morning is a common method of treating "a touch of the liver."

Boracic Acid.—This is an excellent dusting powder, which can be dusted over any raw surface. In cases of sweating feet it can be dusted into the socks before putting them on. The crystals dissolved in cold water make a good lotion for inflamed eyes.

Bromide of Potassium.—Valuable in cases of sleeplessness. From 5 to 30 grains should be dissolved in half a tumblerful of water and taken at bedtime. But drugs should not be resorted to until all other means of curing insomnia have failed, as there is always the risk of the patient's contracting the drug habit. Bromide of potassium, being a nerve sedative, is generally given in cases of epilepsy.

Camphorated Oil.—This is most useful in cases of whooping cough, croup, and all chest troubles, and should be kept handy. It should be well rubbed into the chest.

Carbolic Acid.—One part in twenty or one part in forty of water makes a very good lotion for cleansing wounds.

Carbonate of Bismuth is useful to relieve dyspepsia. Dose, 10 grains, taken as a powder before meals, along with the same quantity of baking soda. Carbonate of bismuth is also a safe and useful drug to be used in cases of chronic diarrhœa. Dose, ½ teaspoonful two or three times daily.

Carlsbad (Karlsbad) Salts.—These will be found to be an excellent purge, and are useful in cases of Bright's disease, and all diseases of the kidneys. Dose varies from ½ teaspoonful to 1 dessertspoonful dissolved in water, and should be taken every morning some time before breakfast.

Carron Oil.—This is made by mixing together equal parts of lime water and linseed oil or olive oil. It is a common household application for burns and scalds. A piece of lint is soaked in the mixture and applied to the burn immediately.

Castor Oil.—This is one of the best purgatives. It can be given with safety to even the youngest infant. The dose varies from ½ teaspoonful to 2 tablespoonfuls. Many people object to it on account of its taste, but it can be quite easily taken if it is suspended between whisky and water, or if it is allowed to float on a small quantity of peppermint water. A drop or two put into the eye is excellent for relieving any inflammation which may be present, *e.g.* after a foreign body has been removed. Castor oil is one of the best remedies for diarrhœa, for it removes from the bowel the irritant causing the trouble.

Chlorate of Potash.—As a gargle in cases of throat catarrh this will be found very satisfactory—12 grains to the ounce of water. It can be obtained in tabloid form, which is very good in cases of sore throat. One should be slowly dissolved in the mouth.

Citrate of Magnesia.—Valuable aperient. Dose, 1 tablespoonful in a tumblerful of water, taken first thing in the morning. Effervescing citrate of magnesia makes a nice cooling drink in hot climates.

Cod Liver Oil.—Especially good tonic for improving the general health; will be found very beneficial in cases of colds and all lung troubles. Dose, 1 teaspoonful to 1 tablespoonful thrice daily, after meals.

Colocynth and Hyoscyanus Pills.—These pills are stronger than rhubarb pills; they do not cause griping.

Condy's Fluid.—Useful antiseptic; very good as a mouth wash in cases of scurvy. Dissolve in water until it is a bright pink.

Epsom Salts.—These make an excellent purge. In small quantities they are very good for biliousness. The dose is from ½ to 1 ounce.

Eucalyptus Oil.—This acts somewhat similarly to ammoniated quinine. The dose is from 1 to 3 drops on a piece of sugar. The oil may be inhaled by those suffering from a cold, or by those who are troubled with chronic laryngitis. In the latter case the best method is that of pouring a little of the oil on boiling water and inhaling the steam. It may be used in the tropics as a preparation to smear on the hands and face to protect them against the bites of mosquitoes.

Friar's Balsam.—A little of this put into a jug of boiling water and inhaled every two or three hours will relieve a cold in the head or chest greatly, but it must only be used when the patient can remain in bed. As an inhalation it will also give relief in asthmatic attacks.

Glycerine.—When mixed with an equal part of rose water, glycerine forms an excellent lotion for chapped hands and cracked lips. It is often used as a rectal injection for the purpose of producing an evacuation of the lower part of the large intestine.

Hazeline Lotion.—If diluted some six or seven times with water and injected in cases of piles, it will generally arrest the bleeding.

Hunyadi Janos should be kept handy as a purgative mineral water.

Iodine.—This will be found to be one of the best local applications for curing chilblains. It should be applied to the chilblain every night, but should not be used if the skin is broken. Also, if painted over the painful area in cases of pleurisy it is useful as a counter-irritant.

Iodoform.—An especially good antiseptic powder; very valuable for dusting ulcerated sores.

Ipecacuanha Wine.—This drug is of great value where children are concerned. In small doses it promotes expectoration; in larger doses it acts as an emetic. Thus 2 to 5 drops for a child, or 10 to 30 for an adult, can be given for a cough where there is difficulty in bringing up the discharge in the throat or bronchial tubes. When used as an emetic, it should be given in doses of from 1 to 2 teaspoonfuls for a child, and 4 to 6 teaspoonfuls for an adult. It can be used to produce vomiting in some cases of poisoning, except in poisoning by acids, and also in bronchitis in children, where expectoration is difficult. It empties the stomach, and at the same time clears the bronchial tubes.

Lime Water.—A very handy drug for stopping vomiting. Dose, 1 tablespoonful every hour for several hours.

Linseed Meal is one of the most useful things that a housewife could have by her side, and yet it is seldom at hand when required.

Liquid Extract of Cascara Sagrada.—Cascara is invaluable in the treatment of chronic constipation, as besides being a laxative it acts as a tonic to the bowels. The dose is from ½ to 1 teaspoonful. It is better to commence with the smaller dose once daily, and to increase it gradually until a teaspoonful is being taken twice a day. When the bowels have begun to act regularly the dose may be gradually diminished, and then discontinued altogether.

Mustard.—Mustard and linseed meal may be combined in the following way: Make a linseed poultice, and for every five ounces of linseed meal used add a quarter of an ounce of mustard which has been rubbed to a smooth paste with a little tepid water.

One or two tablespoonfuls of mustard may be added to a hot foot-bath in a case of chill.

Oil of Peppermint.—In cases of flatulence a few drops of this oil on sugar will give relief.

Oil of Turpentine.—This is an excellent thing to have in the house. In cases of severe pain, such as abdominal pain, a cloth which has been dipped in hot water and then wrung out and sprinkled with turpentine will often prove a great relief.

Parrish's Chemical Food is generally found to be a nourishing tonic for children. Dose, 1 teaspoonful after meals, thrice daily.

Peppermint Water.—One teaspoonful of peppermint water is usually a quick cure for hiccough due to dyspepsia.

Phenacetin and Caffeine.—These two drugs together make a very effective sweating powder. Dose, 8 grains of phenacetin with 2 grains of caffeine. They can also be obtained in tabloid form, and will be found to relieve a headache greatly. Dose, 1 or 2, and repeated in four hours if required.

Potassium Iodide.—An effective drug, useful in cases of actinomycosis (*q.v.*). It should be given internally in doses of from 20 to 60 grains a day, dissolved in water. Also the best remedy for the tropical disease known as Yaws.

Rhubarb Pills.—These are mild pills, useful for children.

Salicylate of Soda.—Dose, 10 grains. This is an excellent sweating powder, and is recommended in cases of chills.

Sal Volatile.—In cases of faintness and of weakness of the heart this is an excellent stimulant. A half to one teaspoonful in water may be given to a grown-up person, while for a child the dose is five to ten drops.

Seidlitz Powders.—These are composed of Rochelle salts and bicarbonate of soda (in the blue paper) and tartaric acid (in the white paper). They are often effective in getting rid of a headache.

Spirits of Camphor.—Four or five drops on a lump of sugar, taken every four hours, form a very good remedy for a common cold.

Terebene.—One of the most satisfactory drugs for flatulence. This can be obtained in 10-minim capsules, one of which should be taken three or four times daily.

Vaseline.—This is a very valuable ointment, and should be found in every household. It is useful in most forms of skin trouble, and 1 ounce of vaseline mixed with 25 grains of salicylic acid forms a very good ointment for removing scurf from the scalp or baldness.

Witch-hazel Ointment.—Useful in arresting the bleeding of piles.

Zinc Ointment.—For cuts this is one of the best applications that can be used. It is soothing, and it hastens the process of healing.

APPLIANCES

Bandages.— ½ in., 1 in., 2 in., 3 in.

Bandages (Triangular).—These are useful in rendering first aid to the injured.

Cotton Wool.—For use as swabs or as covering to dressings.

Double Cyanide Gauze.—This is an aseptic dressing for wounds. It should be dipped in some antiseptic solution and then wrung out before being applied.

Enema Syringe.—For rectal injections. It may also be used to syringe out the ears when they are filled with wax.

Eye Bath.

Lint (Boracic).—This is one of the best dressings that can be applied to a wound. A little zinc ointment may be spread on to keep it from adhering to the raw surface.

Medicine Glass.

Sticking Plaster.—For cuts.

Thermometer.

Throat Brush.

MEDICINE CHEST FOR THOSE GOING ABROAD

Some may hold that a medicine chest in the home is a luxury, but everyone who goes to tropical countries knows that a medicine chest is the most important necessary. The English engineer posted at a station in India 500 miles from the nearest doctor knows that he must be his own physician. He knows that fever stalks in the jungle, he knows that snakes abound, and he is prepared for any eventuality.

The most important drug in tropical climates is *quinine;* the supply must never be allowed to run out.

It will be seen from the following list that the man in the tropics must be prepared for minor surgical operations. Wounds may require cauterising or stitching, abscesses may require lancing.

Tabloids are recommended, because they are easily carried and contain a definite quantity.

In addition to the contents of the home medicine chest those going abroad should take a supply of the following drugs and appliances:

A Menthol Cone.—Useful in relieving the pain of neuralgia.

Amyl Nitrite Capsules.—These are used in cases of fainting or heart failure. One should be placed in a handkerchief, broken by squeezing, and then held to the patient's nose. It has the property of dilating the arteries, and so causing the face to become flushed.

Aspirin Tabloids (each containing 5 grains).—They are useful for relieving headaches. Two may be taken as a first dose, and another tabloid in two hours' time if the pain still persists.

Blue Ointment.

Calomel is a very useful drug to have in tropical countries. It acts as a purgative, and is especially valuable in cases where the liver is congested. The dose is from $\frac{1}{2}$ to 5 grains. It is advisable to keep calomel in tabloid form.

Caustic (Nitrate of Silver).—For cauterising wounds, such as dog-bite or snake-bite.

Easton's Syrup.—Dose from $\frac{1}{2}$ to 1 teaspoonful. This is an excellent tonic for use after any debilitating disease, such as malaria.

Grey Powder.—This is a preparation of mercury and chalk. It can be used as a purgative and as an antisyphilitic. The dose is from $\frac{1}{2}$ to 5 grains. Grey powder is useful as an intestinal disinfectant.

Hypodermic Tabloids (morphia, gr. $\frac{1}{4}$; strychnine, gr. $\frac{1}{100}$; cocaine, gr. $\frac{1}{6}$).—The strychnine tabloids to be used as a stimulant in heart failure, *e.g.* in a case of drowning.

Ipecacuanha Powder.—Twenty to forty grains may be given in dysentery.

Lead and Opium Pills.—One of these will usually stop diarrhœa. Castor oil is best for this purpose, however.

Permanganate of Potash.—This also is better kept in tabloid form. A solution of it forms an excellent deodoriser and antiseptic. Permanganate of potash is given as an antidote in cases of opium poisoning. In snake-bite the crystals or the crushed tabloids may be rubbed into the wound.

Quinine.—This drug is invaluable in the treatment and prevention of malaria. It is handier to keep it in tabloid form. Three grains may be taken daily when in a malarial district. For an attack as much as 20 grains may be taken as a first dose, followed by 5 grains three times a day for several days. Quinine is best taken on an empty stomach. It is liable to cause deafness when taken for some time.

Salol Tabloids (each containing 5 grains).—Useful as an intestinal antiseptic in cholera, typhoid fever, and dysentery. The dose is from 5 to 15 grains.

Yellow Oxide of Mercury Ointment.—For inflammation of the eyes.

A Male Rubber Catheter.—For drawing off the water from the bladder. It can be easily sterilised by boiling, and is especially useful for one not trained in surgery, as it is so soft that it is unlikely to cause damage if not properly used.

Catgut (sterilised).

Dressing Forceps.

Eye Spud.—For removing foreign bodies from the eye.

Hypodermic Syringe and Needles.

Lancet.—For opening septic fingers, &c.

Needles.—For stitching wounds.

Pair of Scissors.

Probe.

Small Glass Syringe.

Splints.—One or two small splints may be carried, but they are easily made when required.

SERUMS

Anti-Dysentery Serum.

Anti-Venom Serum.—For snake-bite.

Diphtheria Antitoxic Serum.—This is the most successful of all serums. Since its introduction there has been a decrease in the mortality of cases of diphtheria.

N. S. Neill, M.B.

DEATH

Many people have a great fear of being buried alive, and this fear is kept awake by the circulation at intervals of sensational tales of supposed corpses coming to life on the way to the graveyard. It is conceivable that in tropical countries, where the dead are buried a few hours after death, premature burial may occasionally take place, but in England such a thing is almost impossible. Here three days usually elapse between death and burial, and by the end of that time there cannot possibly be any doubt as to whether the person is still alive or not. In the mind of the general public a trance is the condition which is most likely to be mistaken for death, but a comparison of the signs of the two will at once prove beyond dispute that the one can never simulate the other. A person in a trance may lie for days in a deep sleep resembling death, but the respiration and circulation, although feeble, still continue. The muscles are relaxed, and there is a total suspension of mental power and voluntary motion, but there is no sign of putrefaction.

THE SYMPTOMS OF APPROACHING DEATH

Death may take place in one of three ways, viz., by asphyxia or suffocation, coma or stupor, or by syncope or fainting.

Asphyxia may be caused by hanging, pneumonia, the inhalation of noxious gases, the blocking of the wind-pipe by such a thing as a piece of beef, or by drowning. In a case of drowning it is often difficult to tell whether life is extinct or not. Artificial respiration should be persevered with for at least an hour.

During the first stage of asphyxia the breathing becomes deeper, more rapid, and more laboured than usual. Certain muscles in the neck and chest which are not used in normal respiration are brought into play, the nostrils are closed with each inspiration and opened with each expiration, and the struggle for air is very great. The lips become blue because of the deficiency of oxygen in the blood, the eyes protrude, and the face assumes an expression of anxiety.

In the second stage convulsions take place. They last for a very short time only, and are followed by exhaustion, which is the characteristic of the third and last stage. In this stage the respiration becomes merely a number of gasps at long intervals, and finally ceases altogether.

Coma may be the result of concussion of the brain, fracture of the skull, apoplexy, inflammation of the brain, or it may be the final stage of enteric fever.

The dying person is powerless and quite insensible. His body is covered with a cold sweat, his pulse is slow, and his pupils do not contract when exposed to the light. His breathing, which at first is loud and stertorous, becomes gradually more and more difficult, and, as mucus collects in the throat, assumes that peculiar rattling sound which is known as the death-rattle.

Syncope may arise from heart disease, shock, a blow on the head or in the pit of the stomach, or sun-stroke.

The face becomes pale, and is bathed in a cold, clammy sweat; giddiness and dimness of vision ensue; there is great restlessness, and a desire for more air. Delirium takes place; gradually this goes on to insensibility, and finally leads to convulsions and death.

THE SIGNS OF DEATH

Stoppage of the Circulation.—This can be determined by placing a finger on the pulse, and the ear over the region of the heart. It is possible that life may still remain in a body although the circulation has ceased, but only for a very short time. If at the end of five minutes there is no sign of its recommencement, it may be taken for granted that death has taken place. Should any doubt exist, a piece of string may be tied, not too tightly, round one of the fingers. If life is still present, the extremity of the finger will begin to swell.

Another test is the opening of a small artery. Many men to whom the thought of premature burial has been a constant obsession have left instructions that this test should be performed on their bodies immediately after death had apparently taken place. During life the blood will proceed from the cut artery in a jerky fashion, but in death it either oozes very slowly or fails altogether to flow. This is because shortly after death the arteries contract and drive the blood into the veins.

Stoppage of Respiration.—The breath can be held voluntarily, but only for one or two minutes. The cessation of respiration for more than five minutes is strongly suggestive of death. It is sometimes not an easy matter to tell by looking at a dying person whether he is breathing or not. A feather held close to the lips will be moved by even the slightest breath. Many use a looking-glass in the same way. If respiration has not ceased, the glass will be dimmed.

Cooling of the Body.—The temperature of the human body in health is 98·4° F., but at the time of death it may be below that, or as high as 105° F. After death it begins to cool, and goes on cooling until it has reached the temperature of the surrounding air. This generally takes from twelve to twenty-four hours, but there are certain conditions which may hasten or retard the process. For instance, a person who has died a lingering death will cool more quickly than one who has been suddenly struck down while in good health, a lean person will cool more quickly than a fat one, and a body which has no covering will not take so long to cool as one wrapped in bedclothes. The temperature of the atmosphere will also have an effect, a cold day favouring cooling more than a hot one. A body lying in cold water will obviously take less time to cool than one lying in a warm room.

In the case of one suffering from a disease that has produced great exhaustion, although the temperature may be below normal, the body never presents that cold, clammy feeling which is so distinctive of death.

Changes in the Eyes.—The pupils fail to react to light, and the eyelids will not close reflexly when the eyeballs are touched. Neither of these two facts is of much importance, as they occur also in those who are deeply under the influence of chloroform. There are, however, two other signs which are of more interest. These are the flattening of the eyeball, and the glassy appearance which it assumes.

Changes in the Skin.—After death the skin loses its elasticity, and becomes pallid and waxy-looking, owing to the absence of the circulation. The want of elasticity is shown by the fact that the parts of the corpse which have been in contact with the object on which it has lain become flattened, and remain so.

If boiling water be applied to the living skin, the blister which rises will contain fluid, but if it be applied to the skin of a corpse the blister will contain air only, and there will be no area of inflammation surrounding its base. This test is one which can be easily performed in case of doubt.

Change in the Distribution of the Blood.—Four or five hours after death the dependent parts of the body begin to undergo a change in colour. They become purple or bluish, owing to the gravitation of the blood. Thus in a body which has lain face upwards for some time the back of the neck, arms, thighs, and calves will be coloured, except where they have pressed heavily on the object supporting the corpse, while the upper parts will be white.

Changes in the Muscles.—As soon as life has departed, the muscles relax, and remain flaccid for about six hours. At the end of this period, while the body is cooling, they gradually begin to grow rigid, and the body becomes fixed in the position it occupied when death occurred. For this reason it ought to be laid out as soon as possible, or difficulty may be experienced in placing it in the coffin.

The muscles can be made to contract shortly after death by electrical stimulus, or even by slight blows, but this power soon passes off. A circumstance like this is quite enough to account for the spontaneous movements of corpses which have been noted, and which have given rise to rumours of premature burial.

Post-mortem rigidity lasts for twenty-four or thirty-six hours. With the commencement of putrefaction the body again becomes relaxed.

Sudden death in healthy subjects and violent exercise before death delay the onset of rigidity. In dry, frosty air it continues for a long time, while in a warm, humid atmosphere it lasts for a short time only.

Putrefaction.—This begins in from thirty-six to forty-eight hours. It is caused by the millions of microbes which have their habitation in the human body, and also by those which are to be found in the soil in which the corpse is laid. The body acquires a greenish-yellow colour, and emits a disagreeable odour. At a temperature of from 75° to 100° F. decomposition goes on most rapidly; it ceases altogether at a temperature of 32° F. Moisture in the air hastens, while a dry atmosphere retards the process. The state of the body at the time of death largely influences the time of commencement of decay. Acute and septic diseases hasten it. Fat people decompose more quickly than thin people. Certain substances, such as arsenic, tend to preserve the body.

Of all these signs of death the only infallible one is putrefaction. The others, when taken singly, are all open to objections, but together they form such conclusive evidence that it is unnecessary to wait for the signs of commencing putrefaction before feeling assured that death has taken place. No corpse in England should be buried within twenty-four hours after death; neither should it be buried unless it has been examined by a doctor. At present he is not obliged by law to inspect it before granting a death certificate.

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